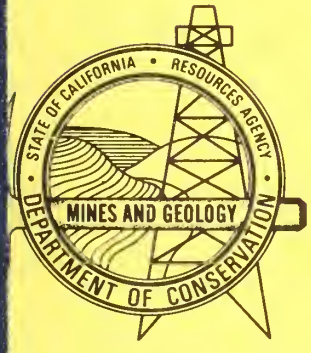
MINERAL LAND CLASSIFICATION: AGGREGATE MATERIALS IN THE SAN FRANCISCO – MONTEREY BAY AREA

1986

CALIFORNIA DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY



SPECIAL REPORT 146

Part I

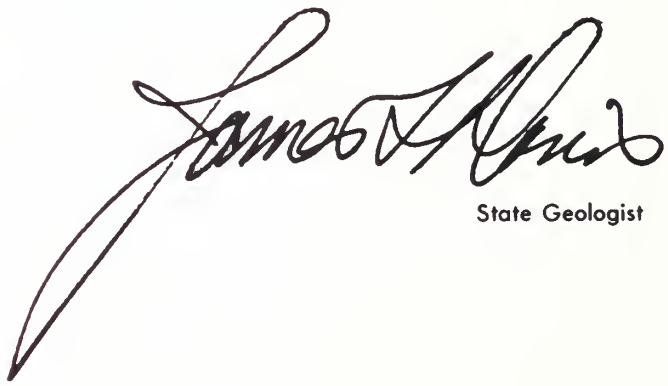
Project Description:
Mineral Land Classification
for Construction Aggregate
in the San Francisco – Monterey Bay Area

FOREWORD

By James F. Davis

Special Repart 146, "Mineral Land Classificatian af the San Francisca - Monterey Bay Area," is the first analysis of mineral resaurces in the San Francisco - Manterey Bay area ta be develaped by the Califarnia Department af Canservation, Divisian af Mines and Gealagy under autharity af the Surface Mining and Reclamatian Act af 1975 (SMARA). This classificatian is pravided to the State Mining and Geology Baard far transmittal ta the lacal gavernments that regulate land use in this regian, and far consideratian af areas, if any, ta be designated as regianally significant. SMARA was enacted by the State Legislature to assure mineral resource conservation and adequate mined land reclamatian.

The Mining and Gealagy Baard adopted guidelines in June 1978 ta be emplayed by the Divisian in its mineral resaurce classification. This repart was prepared in canfarmance with those directives. The undertaking is af great impartance in ecanamic gealagy because it deals with very specific mineral resaurce canservatian issues in areas af intensive competing land use.



State Geologist

PREFACE

Reserve tannage data presented in this repart is accurate as af January 1983, at which time a preprint versian af the repart was circulated ta lead agencies and made available ta the public. Changes in reserves resulting fram either the premature clasure af mines active in 1983, ar the permitting af new mines since that time, may have impacted farecasted depletian dates far the three praductian-cansumptian regians studied. Hawever, the material presented and the fundamental canclusians af the repart remain valid and useful.

David J. Beeby
Urban SMARA Pragram Manager
October 10, 1986

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GLOSSARY OF TECHNICAL TERMS

aggregate	Any of several hard, inert construction materials (such as sand, gravel, shells, slag, crushed stone, or other mineral material), or combinations thereof, used for mixing in specified size distributions with a cementing or bituminous material to form such products as concrete, asphaltic concrete, mortar, and plaster. For the purposes of this report, base and subbase materials (see below for definitions) are considered to be aggregate.
alluvial fan	A low, outspread, relatively flat to gently sloping deposit of sand and gravel, and shaped in aerial view like an open fan or a segment of a cone, normally deposited by a stream with its apex at the place where the stream issues from a narrow mountain valley upon a plain or broad valley.
alluvium	A general term for clay, silt, sand, gravel, or similar unconsolidated detrital material deposited during comparatively recent geologic time by a stream or other body of running water as a sorted or semisorted sediment.
andesite	A gray-to-brown, hard, strongly porphyritic, fine- to medium-grained volcanic rock.
aquiclude	A body of relatively impermeable rock that is capable of absorbing water slowly, but functions as an upper or lower boundary of an aquifer.
aquifer	A body of rock that contains saturated, permeable material sufficient to conduct ground water and to yield economically significant quantities of ground water to wells and springs.
asphaltic concrete	Mixed asphalt (binder) and crushed stone, gravel, and sand used for paving and roofing.
basalt	A dark gray-to-black, hard, dense, fine-grained volcanic rock.
base material	Specified material (coarse gravel or crushed stone) used in the construction of the base course, a bottom layer designed for one or more functions such as distributing load, providing drainage, and minimizing frost action.
basin	A depressed area in which sediments accumulate.
bedrock	A general term for the rock, usually solid, that underlies soil or other unconsolidated material.
breccia	A coarse-grained rock composed of large, angular, and broken fragments of older rocks cemented together with a fine-grained matrix.
Cenozoic	An era of geologic time, from the end of the Mesozoic to the present, considered to have begun about 65 million years ago.
chert	A hard, extremely dense sedimentary rock composed chiefly of silica.
conglomerate	A coarse-grained, sedimentary rock composed of rounded to sub-angular fragments larger than 2 mm in diameter (granules, pebbles, cobbles, boulders) set in a fine-grained matrix of sand, silt, or clay.
consolidation	Any process whereby loosely arranged, soft, or liquid earth materials became firm and coherent rock.
construction materials	Natural and manufactured industrial mineral and rock materials used by the construction industry. These materials include: aggregates (crushed stone, sand and gravel, light-weight aggregate, and slag), cement and cement raw materials, dimension and cut stone, granules, gypsum and anhydrite, and insulating materials. For the purposes of this report, "construction materials" are limited to sand, gravel, and crushed stone.
deposit	An accumulation of a material of any type or from any source that has been concentrated by some natural process or agent, either in consolidated or unconsolidated form.
Cretaceous	The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era) thought to have covered the span of time between 136 and 65 million years ago.

diabase	A fine-grained, dark-colored intrusive rock composed of light-colored feldspar and dark-colored iron-magnesium minerals.
Eocene	An epoch of the lower Tertiary period (after the Paleocene and before the Oligocene) thought to have covered the span of time between 53-54 and 37-38 million years ago.
gabbro	A heavy, coarse-grained, dark-colored intrusive rock composed of light-colored feldspar and dark-colored iron-magnesium minerals.
granite	A light-colored medium- to coarse-grained intrusive rock containing quartz and feldspar.
graywacke	A hard, dark-colored, coarse-grained "dirty" sandstone containing abundant angular rock and mineral fragments.
greenstone	A term used to describe dense, green-colored altered lavas and pyroclastic rocks.
Holocene	An epoch of the Quaternary period (after the Pleistocene) thought to have covered the last 11,000 years before the present.
Jurassic	The second period of the Mesozoic era (after the Triassic and before the Cretaceous) thought to have covered the span of time between 195-190 and 136 million years ago.
limestone	A sedimentary rock that consists chiefly of calcium carbonate (calcite) but which may contain amounts of magnesium carbonate and silica.
melange	A mappable body of rock characterized by the inclusion of fragments and blocks of all sizes, both exotic and native, embedded in a fragmented and generally sheared matrix of more tractable material.
Mesozoic	An era of time, from the end of the Paleozoic to the beginning of the Cenozoic (about 225 million years ago to 65 million years ago).
Miocene	An epoch of the upper Tertiary period (after the Oligocene and before the Pliocene) thought to have covered the span of time between 23-26 and 5-7 million years ago.
P-C Region	Production-Consumption Region. The geographic area which includes the geologic deposits from which aggregate is produced and the market area which those deposits serve.
Pleistocene	An epoch of the Quaternary period (after the Pliocene of the Tertiary period and before the Holocene) thought to have covered the span of time between 11 thousand years and 1.5-2 million years ago.
Pliocene	An epoch of the Tertiary period (after the Miocene and before the Pleistocene) thought to have covered the span of time between 5-7 million years and 1.5-2 million years ago.
Portland cement concrete (P.C.C.)	A mixture of Portland cement, aggregate, and water that will "set" or harden to a rock-like consistency.
quartz diorite	A hard, heavy, coarse-grained, igneous rock composed of feldspars, iron-magnesium silicate minerals, and quartz.
Quaternary	The second period of the Cenozoic era (following the Tertiary) thought to have covered the last 1.5-2 million years.
rhyolite	A light-colored volcanic rock, often exhibiting flow texture, and containing large crystals of quartz and feldspar in a glassy to fine-grained groundmass.
sandstone	A medium-grained sedimentary rock that contains abundant sand-size fragments set in a fine-grained matrix of silt or clay, and firmly united by a cementing material.
serpentinite	A rock consisting of serpentine-group minerals. These minerals (antigorite, chrysotile, and others) have a greasy or silky luster, a slightly soapy texture, and conchoidal (smoothly curved surface) fracture. The minerals are derived from the alteration of pyroxene and olivine. Color may be green, greenish-yellow, greenish-grey, brown, black, or white.

shale	A fine-grained, indurated sedimentary rock formed by the consolidation of clay, silt, or mud.
source area	The area from which the constituent materials of a sedimentary rock are derived.
source rock	The rock from which fragments and other detached pieces have been derived to form a later (sedimentary) rock.
subbase	Another base or underlying support placed below that which ordinarily forms the base; specifically, a layer of material (earth, rock, etc.) placed between the base course and the subgrade, designed to give additional support or to form a porous layer (such as the first layer of large stone laid down in constructing a road, airstrip, or other graded surface).
terrace	Any long, narrow, relatively level or gently inclined surface generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope. A terrace commonly occurs along the margin and above the level of a body of water, marking a former water level.
Tertiary	The first period of the Cenozoic era (after the Cretaceous of the Mesozoic era and before the Quaternary) thought to have covered the span of time between 65 million years and 1.5-2 million years ago.
tuff	A compacted pyroclastic deposit of volcanic ash and mineral and rock fragments.

Reference Sources for this Glossary:

Gary, M., McAfee, R., Jr., and Wolf, C.L., editors, 1972, American Geological Institute Glossary of Geology, 805 p. (Modified definitions of terms and rock types.)

Jennings, C.W., Strand, R.G., and Rogers, T.W., 1977, Geologic map of California: California Division of Mines and Geology Geologic Data Map No. 2, scale 1:750,000. (Age dates.)

EXECUTIVE SUMMARY
PART I

The San Francisco - Monterey Bay area, with its population of over six million people, is the largest urbanized area in northern California. This region includes 12 counties that border on the San Francisco or Monterey bays. Although substantial portions of the region have been developed, urbanization is still occurring at a rapid rate.

In any urban development it is important that land-use decisions are made with full recognition of the natural resources of the area. Mineral resources, including aggregate, are limited resources within a given region. To help those who make land-use decisions, this report presents aggregate resource information for the region, including its expected aggregate resource needs over the coming decades. For many years, the San Francisco - Monterey Bay area has been fortunate because adequate quantities of low-cost aggregate materials have been available locally. However, as more and more areas become urbanized, suitable sand, gravel, and stone deposits are being lost through urban development and are being diminished yearly by mining.

The principal objective of this project is to classify land in the San Francisco - Monterey Bay area into Mineral Resource Zones (MRZs) based on guidelines adopted by the California State Mining and Geology Board. This classification project will assist the Board in designating lands that are needed for their mineral content, as mandated by the Surface Mining and Reclamation Act of 1975. This designation process, in turn, has been designed to assist and guide local lead agencies in preserving essential mineral resources for future use through proper zoning ordinances.

Information will be submitted to the State Mining and Geology Board in a series of parts covering three production-consumption (P-C) regions that have been identified in the San Francisco - Monterey Bay metropolitan area. Part I is an introductory report describing the background, purpose, and scope of the overall project. Part II presents the classification of sand and gravel and stone resource areas in the South San Francisco Bay P-C Region. Information in Part II includes maps showing the locations of significant sand and gravel and stone deposits of the South San Francisco Bay P-C Region, as well as tables, charts, and discussions that present data on population, aggregate production and consumption, projected future aggregate needs, and volumetric estimates of available aggregate resources. Part III presents similar data for the North San Francisco Bay P-C Region, and Part IV covers the Monterey Bay P-C Region.

EXECUTIVE SUMMARY HIGHLIGHTS
PARTS II, III, and IV

For the convenience of readers, highlights from the executive summaries of Parts II, III, and IV of this report are presented herein. For supporting documentation of these conclusions or more detail, the full reports should be consulted.

PART II

The South San Francisco Bay P-C Region

- The anticipated consumption of aggregate resources in the South San Francisco Bay P-C Region to the year 2030 is forecast to be 1.5 billion tons, of which approximately 39 percent, or 580 million tons, must be of P.C.C. quality.

- Unless additional resources are permitted for mining, or alternative resources are utilized, total existing reserves (both P.C.C. and non-P.C.C. aggregate) would be depleted by the year 1999, only 16 years after the writing of this report. About 552 million tons of permitted aggregate reserves exist in the P-C region. About 49 percent of the permitted reserves are sand and gravel, and 51 percent are crushed stone. In total, the 552 million tons amount to 37 percent of the anticipated consumption during the next 50 years.

- Of the 552 million tons of permitted reserves, about 313 million tons are suitable for use as P.C.C. aggregate. This amounts to 54 percent of the anticipated consumption during the next 50 years.

- The expected longevity of the existing reserves is based upon the assumption that mining of these reserves will continue to be permitted until the reserves are depleted.

- P.C.C. reserves, because of their higher quality specifications, will be the most difficult to replace as existing permitted deposits are depleted.

- Of the 15 stratigraphic/lithologic units suitable for aggregate in the P-C region, only seven are known to be suitable for P.C.C. aggregate.

- A total of 6.3 billion tons of aggregate resources (including reserves) have been identified within the South San Francisco Bay P-C Region. One and one-tenth billion tons of sand and gravel and 5.2 billion tons of crushed stone compose the 6.3 billion tons of resources. Of this total, 2 billion tons are on park lands.

- If all of the reserves suitable for P.C.C. aggregate are utilized for only that purpose, P.C.C.-grade reserves would be depleted in about 24 years (2007). However, we can expect that some of the production from these reserves will be used for non-P.C.C. applications; consequently, the expected exhaustion of these reserves will occur considerably earlier.

- Seven sectors containing about 489 million tons of P.C.C. sand and gravel do not have permitted mining or established reserves.

- Of 34 aggregate production sites in the South San Francisco Bay P-C Region, 12 contain sand and gravel resources and 22 contain crushed stone resources.

PART III:

The North San Francisco Bay P-C Region

- The anticipated consumption of aggregate resources in the North San Francisco Bay P-C Region to the year 2030 is forecast to be 478 million tons, of which approximately 24 percent, or 115 million tons, must be of P.C.C. quality.

- Unless additional resources are permitted for mining, or alternative resources are utilized, total existing reserves (both P.C.C. and non-P.C.C. aggregate) would be depleted within 56 years (2036). About 540 million tons of permitted aggregate reserves exist in the P-C region. About 20 percent of the permitted reserves are sand and gravel, and 80 percent are crushed stone. In total, the 540 million tons amount to 113 percent of the anticipated consumption during the next 50 years.

- Of the 540 million tons of permitted reserves, about 112 million tons are suitable for use as P.C.C. aggregate. This amounts to 97 percent of the anticipated consumption during the next 50 years.

- The expected longevity of the existing reserves is based upon the assumption that mining of these reserves will continue to be permitted until the reserves are depleted.

- PCC reserves, because of their higher quality specifications, will be the most difficult to replace as existing permitted deposits are depleted.

- Of 15 stratigraphic/lithologic units suitable for aggregate in the P-C region, only four are suitable for P.C.C. aggregate. Only two of these units (Quaternary alluvium and Novato Conglomerate) are sources of sand and gravel. This contrasts markedly with other P-C regions examined to date, where P.C.C. sand and gravel can be extracted from several older sedimentary formations as well as from modern stream deposits.

- A total of 2.4 billion tons of aggregate resources (including reserves) have been identified within the North San Francisco Bay P-C Region. Of this total, 31 million tons are on park lands. Nine-tenths of a billion tons of sand and gravel and 1.4 billion tons of crushed stone compose the 2.4 billion tons of resources.

- If all of the reserves suitable for P.C.C. aggregate are utilized only for that purpose, P.C.C.-grade reserves would be depleted in about 49 years. However, we can expect that some of the production from these reserves will be used for non-P.C.C. applications; consequently, the expected exhaustion of these reserves will occur considerably earlier.

- Most of the high quality P.C.C. resources are present in two sectors in the Russian River area. These also constitute the main source of sand and gravel in the P-C region. Within these two sectors are 21 subsectors that contain a total of about 854 million tons of sand and gravel resources.

- Of 34 aggregate production sites in North San Francisco Bay P-C Region, 14 contain sand and gravel resources and 20 contain crushed-stone resources.

PART IV:

The Monterey Bay P-C Region

- The anticipated consumption of aggregate resources in the Monterey Bay P-C Region to the year 2030 is forecast to be 374 million tons, of which approximately 24 percent, or 90 million tons, must be of P.C.C. quality.

- About 786 million tons of permitted aggregate reserves exist in the P-C region. This amounts to more than twice the anticipated consumption during the next 50 years.

- The current outlook for meeting the 50-year demand for aggregate material from this P-C region is quite good. The rapid acceleration of exports to other P-C regions or a series of decisions that provide for land uses incompatible with the mining of mineral resources, could, however, abruptly alter the resource situation and the outlook for meeting the 50-year needs.

- The surplus volume of reserves in the Monterey Bay P-C Region is insufficient to offset the large deficit in the adjacent South San Francisco Bay P-C Region. The two P-C regions have a combined anticipated consumption (through the year 2030) of 1,874 million tons. The total combined aggregate reserves for the two regions are 1,338 million tons. These reserves represent only 71 percent of anticipated consumption during the next 50 years.

- Of the 786 million tons of permitted reserves, about 700 million tons are suitable for use as P.C.C. aggregate.

- A total of 3.1 billion tons of aggregate resources (0.7 billion tons of sand and gravel and 2.4 billion tons of crushed stone) have been identified in the Monterey Bay P-C Region. About 960 million tons of these resources are contained in park lands.

- Five sectors containing about 963 million tons of P.C.C. sand, gravel, and crushed stone, do not have permitted mining or established reserves.

- Of 26 aggregate production sites in the Monterey Bay P-C Region, 21 contain sand and gravel resources and five contain crushed stone resources

SPECIAL REPORT 146

MINERAL LAND CLASSIFICATION: AGGREGATE MATERIALS IN THE SAN FRANCISCO - MONTEREY BAY AREA

Part I

Project Description: Mineral Land Classification For Construction Aggregate In The San Francisco - Monterey Bay Area

INTRODUCTION

Special Report 146, "Mineral Land Classification: Aggregate Materials in the San Francisco - Monterey Bay Area," is the first analysis of mineral resources in the San Francisco - Monterey Bay area to be developed by the California Department of Conservation, Division of Mines and Geology under the Surface Mining and Reclamation Act of 1975, and provided to the State Mining and Geology Board and to the local governments that regulate land use in this region. This report follows the guidelines adopted by the State Mining and Geology Board in June 1978, and presents detailed data concerning economic geology of construction aggregates in the San Francisco - Monterey Bay area. The report is divided into four parts for ease of discussion and transmittal of data. Part I (herein) discusses general aspects of the project. Part II presents the classification of sand and gravel and stone resource areas in the South San Francisco Bay Production-Consumption (P-C) Region, and includes maps showing the locations of significant sand and gravel and stone deposits, as well as tables, charts, and discussions that present data on population, aggregate production and consumption, projected future aggregate needs, and estimates of available aggregate resource tonnages. Part III presents similar data for the North San Francisco Bay P-C Region, and Part IV covers the Monterey Bay P-C Region.

OVERVIEW OF AGGREGATE

Sand, gravel, and crushed rock are "construction materials." These commodities, collectively referred to as aggregate, provide bulk and strength to Portland cement concrete (P.C.C.), asphaltic concrete, and plaster or stucco. Aggregate is also used as road base, subbase, septic tank drain rock and fill. Aggregate normally provides from 80 to 100 % of the material volume in the above uses.

Between 1971 and 1980, an average of 34.1 million tons of aggregate per year were produced and consumed in the San Francisco - Monterey Bay area. This amounted to one-fourth of California's annual production average over the same period. High-quality (P.C.C.-grade) aggregate in the San Francisco - Monterey Bay area presently (1983) sells for an average of about four dollars per ton at the plant site after crushing, washing, sizing, and stockpiling. However, the plant-site cost of aggregate constitutes only a portion of the delivered price of Portland cement concrete or asphaltic concrete. The remainder is the cost of handling, transportation, mixing, and profit. Of these, transportation is the most significant factor determining the cost of the final product at the delivery point.

In past years, the population centers of the San Francisco - Monterey Bay area have been served from local deposits of high-quality material from which aggregate could be obtained and utilized at relatively low costs. However, high quality deposits are rapidly being depleted and many of the potential sources already have been lost to irreversible land uses that are incompatible with mining. However, not all of the remaining sand, gravel, and crushed rock sources in the San Francisco - Monterey Bay area can supply materials for use in higher-grade aggregate products such as Portland cement concrete. Some deposits have been subjected to extreme weathering by ground water, or contain chemically reactive elements that make them unacceptable for this use. Rarely is in-place aggregate raw material, even from the highest-grade deposits, physically or chemically suited for every type of aggregate use. In fact, every potential deposit must be tested to determine how much of its material can meet specifications for a particular type of use, and what processing is required.

Specifications for various uses of aggregate material have been established by several agencies, such as the U.S. Bureau of Reclamation, the U.S. Army Corps of Engineers, and California Department of Transportation (Caltrans), to ensure that aggregate is satisfactory for particular uses. These agencies, and other

major consumers of concrete, test aggregate for acceptance by standard test procedures outlined by such organizations as the American Society for Testing Materials and the American Association of State Highway Officials.

Most aggregate specifications have been established to ensure the manufacture of strong, durable materials capable of withstanding the physical and chemical effects of weather and use. For example, specifications for Portland cement concrete and concrete products prohibit or limit the use of rock materials containing mineral substances such as gypsum, zeolite, pyrite, opal, chalcedony, chert, siliceous shale, volcanic glass, and some high-silica volcanic rocks. Gypsum shortens the setting time of Portland cement, pyrite dissociates to yield sulfuric acid and iron oxide stain, and other substances contain silica in a form that reacts with alkali substances in the cement to cause cracks and "pop-outs."

Specifications also call for precise particle-size distributions in the various uses of aggregate. For some uses, such as asphalt paving, particle shape is specified. Caltrans' Standard Specifications (1975, p. 169-174) requires that at least 25 percent by weight of coarse aggregate (¼ inch to ¾ inch diameter) used as Class 2[1] aggregate base material shall be crushed particles. Furthermore, aggregate material used with bituminous binder to form sealing coats on road surfaces shall consist of at least 90 percent by weight of crushed particles. Crushed stone is preferable to natural gravel in asphaltic concrete because asphalt adheres better to broken surfaces than to rounded surfaces, and the interlocking of angular particles strengthens the asphaltic concrete and road base.

In contrast to the aggregate sources in the greater Los Angeles area, where most of the aggregates are derived from Holocene sediments, in the San Francisco Bay region at least 45 percent of the aggregates produced are crushed stone derived from older rock units (Chesterman and Manson, in preparation). At most of the larger sand and gravel plants, oversize rock clasts (greater than 1½ inch diameter) are screened from the alluvial raw material and stockpiled or crushed to be sold as crushed stone.

Production costs include mining and processing raw materials for use as aggregate. Drilling and blasting, extraction equipment, and the crushing, screening, and washing equipment all add to the price of aggregate. The cost of producing crushed stone suitable for Portland cement concrete aggregate is estimated to be about $0.75 to $1.00 per ton more than the cost of producing a ton of alluvial gravel for the same use. When natural sand is in short supply, the additional cost of producing "stone sand" (sand produced by grinding at the plant) is also a production-cost factor.

The preferred use of one aggregate material over another in construction practices depends not only on specification standards, but also on economics. Alluvial gravel is preferred to crushed stone for Portland cement concrete aggregate because the rounded particles of alluvial sand and gravel result in a wet mix that is easier to work than a mix composed of angular fragments. The workability of a mix consisting of Portland cement with crushed rock aggregate is improved by adding more sand and water. More cement must then be added to the mix in order to maintain concrete durability standards. At the present time, the additional cement amounts to about a quarter sack per cubic yard of concrete at an additional cost of about $0.75 per yard of mix. Although slightly more care is required in pouring and placing wet mix containing crushed rock, Portland cement concrete made with this aggregate is as satisfactory as that made with sand and gravel of comparable rock quality. Aggregate material is essential to the needs of a modern society. Because it is a resource of great importance to the economy of any metropolitan area, it is neccesary that lead agencies be aware of significant resources available within their jurisdictions.

[1]Caltrans' specifications for Class 2 aggregate include the following categories: substance content, grain-size distribution, particle shape, and rock quality requirements.

BACKGROUND AND PURPOSE

Urban expansion has been a major contributing factor to the loss of significant mineral resources in past years. In response to the problem of conflicting land use and the essential need for mineral products, the California State Legislature enacted the Surface Mining and Reclamation Act of 1975 (SMARA). SMARA requires the State Geologist to classify,[2] according to the presence or absence of significant mineral deposits, certain areas of the state which are subject to urban expansion or other irreversible land uses incompatible with mining. Urbanizing areas are identified by the State Office of Planning and Research (OPR). The area boundaries are modified to reflect current land use through consultation with local lead agencies and selected on-site field inspection.

The State Mining and Geology Board, upon receipt, review, and approval of the classification information from the State Geologist, transmits the classification report to the appropriate lead agencies and makes it available to other interested parties. Upon receipt of the classification report, each lead agency must within 12 months develop and adopt mineral resource management policies to be incorporated in its general plan which will:

1. Recognize the mineral classification information, including the classification maps, transmitted to it by the Board and include the classification maps in its general plan.

2. Emphasize the conservation and development of identified significant mineral deposits.

After receipt of mineral classification information from the State Geologist, the State Mining and Geology Board may designate identified mineral deposits as being of statewide or regional significance. Procedures for designation[3] of lands containing significant mineral deposits are specified in Section II.2 of the State Mining and Geology Board's "Guidelines for Classification and Designation of Mineral Lands" (see Appendix A-3, p. 25).

The objective of the classification and designation processes is to assist local government in identifying areas that may be reserved for their essential mineral resources, which might otherwise be unavailable when needed (see Appendix A-3).

On January 13, 1978, the State Mining and Geology Board SMGB) adopted Resolution No. 22, "Priorities for Mineral Land Classification" (revised November 2, 1978), which scheduled the general order of work for the State Geologist in classifying different areas within the state. In this Resolution (Appendix A-2), the "East San Francisco Bay Counties" were given Priority 1 status, while the "South, West, and North San Francisco Bay Counties" received Priority 2 status. This resolution was superseded in November 1982 by SMGB Resolution #82-14, which made the entire Bay area Priority 1.

The "Guidelines for Classification and Designation of Mineral Lands" were adopted by the State Mining and Geology Board on June 30, 1978. These have been included as Part II of California Division of Mines and Geology Special Publication 51, which

[2]*Classification* is the process of identification of lands containing significant mineral deposits without regard for present land use or land ownership.

[3]*Designation* is the formal recognition by the State Mining and Geology Board, after consultation with lead agencies and other interested parties, of areas containing mineral deposits of regional or statewide significance.

is available from the Division free of charge. The guidelines are also included in this report as Appendix A-3.

The purpose of the "Guidelines" is to implement SMARA by providing direction to the State Geologist in carrying out mineral resource classification, and to establish procedures by which the Board may designate mineral-bearing lands of statewide or regional significance. Section I.1(a) of the "Guidelines" requires that the State Geologist classify specified areas into *Mineral Resource Zones* (MRZ) or *Scientific Resource Zones* (SZ) as defined in Section I.2, of the "Guidelines". Although California has a wide range of mineral commodities within its borders, the Mining and Geology Board recognizes that construction materials (sand, gravel, and crushed rock) are produced regionally, are used in every urban area of the state, and require special classification data. Section I.3 of the guidelines requires that classification reports that pertain to deposits of construction materials include the following information: (1) the location and estimated total quantity of construction material that is geologically available for mining; (2) limits of the market (production-consumption) region which the potential commodity would serve; and (3) an estimate of the total quantity of material that will be needed to supply the requirements of the consumption region for the next 50 years. This information will assist the State Mining and Geology Board in determining the significance of these types of deposits.

The mineral land classification of the San Francisco - Monterey Bay area was initiated in October 1978 by the State Geologist. Included in the project area are Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Clara, Santa Cruz, western Solano, and Sonoma counties (Figure 1.1). Construction aggregate resources of the area were selected for initial classification, to be followed at a later time by the classification of other mineral resources.

Each aggregate deposit was evaluated separately, and then in order to determine its possible statewide or regional significance, the deposit was considered as part of a production-consumption (P-C) region established on the basis of existing aggregate consumption patterns. The San Francisco - Monterey Bay area is essentially covered by three P-C region studies.

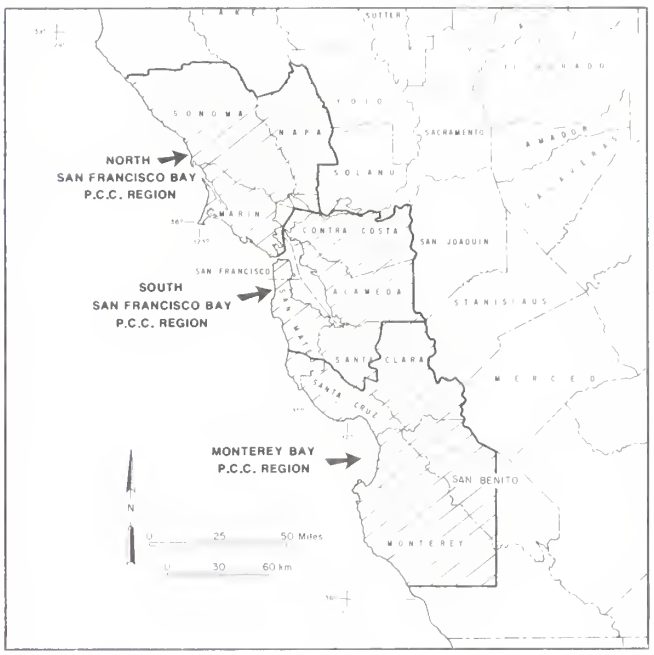

Figure 1.1 Project Boundaries: Mineral Land Classification in the San Francisco-Monterey Bay Area.

DETERMINING PROJECT BOUNDARIES

Maps supplied by the State Office of Planning and Research (OPR) served to identify urbanized and urbanizing areas within the San Francisco - Monterey Bay area (Plate 1.1). These maps are part of a series issued by the Office of Planning and Research in July 1975 entitled "Urban Expansion Map of California." The generalized maps were published at a scale of 1:500,000 (one inch equals approximately 8 miles) and show "Existing Urban - 1970" and "Projected Urban - 1990" areas.

The "existing urban" areas shown on the OPR maps represent the *urbanized* areas used as the basis for the land classification maps developed during the present study; the "projected urban" areas are the *urbanizing* areas. Because the maps were produced several years ago, those boundaries were modified to reflect current conditions. This was accomplished by contacting local lead agencies (usually planning departments), to determine where urbanization is anticipated to occur in the next 10 to 30 years, and by on-site examination to determine where urbanization had occurred since the OPR maps were issued.

The resulting projected "urban" or "urbanizing" boundaries were modified further to include a number of active aggregate mines and significant mineral deposits, which lie outside of the urbanizing boundaries but within the P-C regions. These deposits were included in the classification reports because their loss would have a major impact on aggregate supply within the P-C regions. The modified OPR boundaries are shown on quadrangle maps that accompany each P-C region study.

Over 9360 square miles of area were evaluated during this study, from which over 2070 square miles covering portions of 104 quadrangles were actually classified. As a result, the field and office work extended over a seven year period, from 1978 through 1984. Listed below are the 12 counties and the months during which field work was done in each county:

Alameda County
September 1978-January 1979; March 1979

Contra Costa County
January 1979, March 1979

Santa Clara County
March 1979-May 1979

San Mateo County
May 1979

San Francisco County
May 1979

Sonoma County
February 1980; August 1980; May 1981

Napa County
May 1980; August 1980

Solano County
August 1980

Marin County
August 1980; October 1980

San Benito County
July 1981

Santa Cruz County
July 1981; October 1981

Monterey County
August 1981

In addition, selected areas were field-checked again in August 1982, May 1983, and September-October, 1984.

DETERMINATION OF PRODUCTION-CONSUMPTION REGION BOUNDARIES

To evaluate the significance of a mineral commodity, it is necessary to know where the commodity is produced and where it is consumed. Some mineral commodities, such as the borate produced from certain Death Valley deposits, have a worldwide market area; therefore, the Death Valley deposits have worldwide significance. Low unit-value bulk commodities, such as sand and gravel and crushed stone, however, are marketed regionally and their significance is measured on a regional level.

Large metropolitan areas usually obtain construction aggregate from several regional sources. The 12-county San Francisco - Monterey Bay area obtains its aggregate supplies from approximately 94 plants scattered through the region (Plate 1.2). The plants operate within the jurisdictional boundaries of 19 lead agencies (Table 1.1). Since the producers within a production district generally share a common market region, the collective group, rather than the individual producer, is treated as the basic aggregate-producing unit in this study.

Production Districts

An aggregate production district is typically composed of a group of competing companies in close geographic proximity to one another that mine from a single deposit. The production district concept is most appropriate when evaluating high-quality, relatively scarce commodities such as P.C.C.-grade sand and gravel. It has less applicability to geologically abundant deposits of stone suitable only for asphaltic concrete aggregate or road base material.

There are a total of 94 significant quarries and gravel pits in the 12-county San Francisco - Monterey Bay area. Of this total,

Table 1.1. List of possible lead agencies (county and incorporated city governments) and other affected agencies (special districts, State and U.S. Government agencies) located within or adjacent to the project boundaries of the Mineral Land Classification of the San Francisco Bay Area. (Cities and Counties that have active aggregate operations within their jurisdictional boundaries are denoted by asterisks.)

SOUTH SAN FRANCISCO BAY P-C REGION

*Alameda County	*Contra Costa County	*San Mateo & San Francisco Counties		*Santa Clara County
*Alameda	Antioch	Atherton	Redwood City	Campbell
Albany	Brentwood	Belmont	San Bruno	Cupertino
Berkeley	Clayton	Brisbane	San Carlos	Los Altos
Dublin	Concord	Burlingame	San Francisco	Los Altos Hills
Emeryville	El Cerrito	*Colma	San Mateo	Milpitas
*Fremont	Lafayette	Daly City	So. San Francisco	Monte Sereno
Hayward	Martinez	Foster City	Woodside	Mountain View
Livermore	Pinole	Half Moon Bay		*Palo Alto
Newark	Pittsburg	Hillsborough		*San Jose
*Oakland	Pleasant Hill	Menlo Park		Santa Clara
Piedmont	*Richmond	Millbrae		Saratoga
Pleasanton	San Pablo	*Pacifica		Sunnyvale
San Leandro	Walnut Creek	Portola Valley		
Union City				

NORTH SAN FRANCISCO BAY P-C REGION

*Marin County	*Napa County	*Solano County	*Sonoma County
Belvedere	Napa	Benicia	Cloverdale
Corte Madera		Vallejo	Cotati
Fairfax			Healdsburg
Larkspur			Petaluma
Mill Valley			Rohnert Park
Novato			Santa Rosa
Ross			Sebastopol
San Anselmo			Sonoma
San Rafael			
Sausalito			
Tiburon			

MONTEREY BAY P-C REGION

*Monterey County	*San Benito County	*Santa Clara County	*Santa Cruz County
Carmel	Hollister	Gilroy	Aptos
Del Rey	San Juan Bautista	Morgan Hill	Ben Lomond
Marina			Boulder Creek
Monterey			Capitola
Pacific Grove			Felton
Salinas			Santa Cruz
Sand City			Scotts Valley
Seaside			Soquel
			Watsonville

only 29 are capable of producing P.C.C.-grade sand and gravel, and 23 of the 29 group naturally into three major production districts. These three major districts are the Russian River area in Sonoma County, the Livermore Valley - Sunol Valley - Niles Cone area in Alameda County, and the San Benito River area in San Benito County.

Disseminated throughout the 12 counties is a scattering of isolated smaller groups and individual quarry operations. These scattered operations produce a variety of aggregate products. Depending on the resource at the quarry, the highest-quality product may be P.C.C. aggregate, or it may be subbase material and fill. Only those operations capable of producing aggregate acceptable for subbase or higher uses have been classified and included in this report.

Transportation Rates

Analysis of aggregate transportation rates is neccesary to determine the market area which can be served by producers in a given production district. If a customer can obtain a certain type of aggregate from two or more producers, the deciding factor in selecting a supplier often will be the price of transportation. Three types of transportation are used in the aggregate industry: barge, truck, and railroad. Only one operator in the study area uses barges for hauling aggregate, and his material is shipped by barge from the dredging site in the Sacramento River or San Francisco Bay to the company terminal in Oakland, where it is loaded into trucks. All of the producers use trucks to haul at least some of their material, since trucking allows variation in points of origin and destination, and is the cheapest means of short-haul transportation. Several operators use rail transportation where feasible for hauling large amounts of aggregate relatively long distances. Although the use of rail shipment is restricted to those points of origin and destination that are "on-line," long-distance railroad rates are often lower than truck rates for the same route.

Truck haulage rates generally follow minimum transportation rates that are reported and periodically updated by the California State Public Utilities Commission (PUC) in a series of publications entitled "Minimum Rate Tariffs" (MRT). One of these publications, MRT 20, Section 2 (California State Public Utilities Commission, 1978) fixes minimum transportation rates between specific points of origin and delivery in the San Francisco Bay area for independent trucking firms. Because the origin and destination points are code-numbered, both the Commissions's "Directory 2, Description of Production Areas and Delivery Zones" and its supplement (Supplement 2, effective October 1, 1973) are needed to determine the transportation rates.

MRT 20 covers only selected portions of the 12-county San Francisco - Monterey Bay area. Also needed are MRT 7-A (California State Public Utilities Commission, 1972) and its current supplement (Supplement 16, effective November 1, 1979) which list transportation charges based upon mileage or delivery time. Table 1.2 shows transportation costs in dollars per ton to haul aggregate by truck between selected points of origin and destination in the 12-county area. Although the PUC minimum rates do not apply to aggregate producers who transport their own products, the producers use the PUC minimum rates as guidelines for haulage rates.

Transbay bridge tolls increase transportation costs for aggregate, as well as other commodities. Table 1.3 lists the tolls in effect on February 14, 1983 for the major San Francisco Bay area bridges. The bridge tolls are not included in the PUC rates.

The Interstate Commerce Commission (ICC) validates a collection of rate tariffs that govern the railroad transport of aggregate (see Table 1.4). These rates are published in "Freight Tariff 4305-B, Rock , Sand, and Gravel Tariff" by the Pacific Southcoast Freight Bureau (1981). The railroad freight rates are important within the 12-county San Francisco - Monterey Bay area, because a substantial amount of aggregate is transported by rail from Alameda County and the Monterey Bay area to the San Francisco Peninsula, and from the Russian River area in Sonoma County to Marin County.

Findings from this evaluation of transportation costs were compared with a survey of producers and an examination of their marketing records. Aggregate sold at each of the 130 batch plants was traced back to its source at individual quarries and gravel pits.

Production-Consumption Regions

The analysis of quarry distribution, batch plant and hot plant locations, transportation costs, and aggregate marketing practices throughout the 12-county area showed that the area should be divided into three P-C regions. The three regions are the South San Francisco Bay P-C Region, the North San Francisco Bay P-C Region, and the Monterey Bay P-C Region. Each of these regions contains a major production district and the market area that it supplies with P.C.C. aggregate. The boundary between two adjacent P-C regions represents the approximate point where a consumer could buy P.C.C. aggregate for an equal delivered price from either of two competing production districts.

The primary source of P.C.C. aggregate for the South San Francisco Bay P-C Region is the Livermore Valley - Sunol Valley - Niles Cone production district. These three areas are all within the drainage basin of Alameda Creek and its tributaries, and are underlain by Quaternary stream channel and alluvial deposits. Minor amounts of sand are obtained from San Francisco Bay and the Sacramento River near Antioch. The consumption region for this P.C.C. aggregate consists of Alameda, Contra Costa, San Francisco, San Mateo, and northern Santa Clara counties. P.C.C. aggregate is also obtained from limestone quarries on the San Francisco Peninsula. Additional P.C.C. aggregate is imported from the Monterey Bay P-C Region. This P-C region covers approximately 2,360 square miles, of which approximately 1,240 square miles were classified. The classified areas include portions of 46 quadrangles, and contains 34 active aggregate operations.

The primary source of P.C.C. aggregate for the North San Francisco Bay P-C Region is the Quaternary alluvial and stream channel deposits of the Russian River production district in Sonoma County. This district can be divided into three parts: Alexander Valley, the Middle Reach of the Russian River, and Dry Creek (a tributary of the Russian River). Minor amounts of P.C.C. sand and gravel are also mined from gravel bars along the Gualala River. The consumption region for the Russian River district consists of Marin, Napa, Sonoma, and western Solano counties. The crushed stone producers are widely scattered within the P-C region, and supply (with one exception) aggregate for uses other than Portland cement concrete. This P-C region covers approximately 2,910 square miles, of which approximately 445 square miles were classified. The classified areas include portions of 36 quadrangles, and contains 34 active aggregate operations.

The main production district in the Monterey Bay P-C Region consists of the Quaternary alluvium and stream channel deposits of the San Benito River, near Hollister in San Benito County. P.C.C. aggregate is shipped by truck to markets in Monterey, San Benito, Santa Cruz, and southern Santa Clara counties.

Table 1.2. Transportation cost in dollars per ton to truck aggregate between selected production areas and delivery centers, San Francisco-Monterey Bay region. From Chesterman and Manson.

Cost figures based on Public Utility Commission (P U C) rates (1/27/78) Tariff 7A is based on a 1-way 25 ton haul Tariff 20 is based on a 25 ton haul from a specific production area to a specific delivery area MRT 7A ☐ MRT 20 ◩		*Production Areas*																											
		Jimtown	Windsor	Bloomfield	Forestville	Petaluma	Novato	Point Reyes	San Raphael	Pope Creek	Winters	Saint Helena	Napa	Lake Herman	Richmond (7–C)	Clayton (7–A)	East Bay Hills (1–G)	Livermore (1–B)	Fremont (1–A)	Brisbane (41–B)	Los Altos (43–H)	South San Jose (43–C)	Felton–Santa Cruz (44–B)	Aromas	Gilroy	Hollister	Monterey–Seaside	Metz	King City
Delivery Areas	San Francisco (104)	4.51	4.00	3.36	3.85	2.54	2.12	2.44	1.58	4.31	4.00	3.69	2.75	2.38	1.94	2.77	2.17	3.21	2.83	1.01	3.05	3.72	4.91	5.01	4.51	5.26	5.88	7.38	7.38
	Marin	4.00	3.46	2.80	3.36	2.01	1.58	1.90	1.01	4.51	4.16	3.85	2.86	2.18	1.30	2.80	2.80	3.56	3.25	1.36	3.02	3.85	4.51	5.88	5.01	5.88	6.39	8.37	8.37
	Novato	3.07	2.59	1.90	2.38	1.07	58	1.41	1.19	3.85	3.56	3.07	2.13	1.85	1.41	2.80	2.44	3.69	3.36	2.28	3.85	4.00	5.51	5.88	5.88	6.39	6.89	8.37	7.88
	Petaluma	2.44	1.96	1.25	1.80	.39	1.30	1.52	1.85	3.15	3.69	2.49	1.63	2.06	2.06	3.02	3.07	4.16	3.85	2.80	4.51	4.51	5.88	6.39	5.88	6.39	7.30	8.84	8.84
	Santa Rosa	1.63	1.07	1.07	1.19	1.30	2.17	2.38	2.70	3.56	4.51	2.91	2.44	4.51	2.91	3.85	3.85	5.01	4.76	3.69	5.26	5.26	6.89	7.38	6.39	7.38	8.37	9.80	9.32
	Geyserville	.70	1.01	2.33	1.52	2.49	3.36	3.56	3.85	2.75	3.85	2.06	2.97	4.00	4.00	5.01	5.01	5.88	5.88	4.26	6.39	6.39	7.88	8.37	7.88	8.37	9.32	10.75	10.75
	Vallejo	3.36	3.69	3.02	3.46	1.80	1.80	2.65	2.12	2.80	2.33	2.12	1.07	64	1.36	1.63	2.12	2.75	3.07	2.49	4.51	4.31	5.01	6.39	5.51	6.39	6.39	8.37	8.37
	Napa	2.65	3.07	2.38	2.91	1.58	2.01	2.65	2.33	2.06	2.38	1.36	.52	1.47	2.12	2.44	2.86	3.46	3.85	3.25	5.26	5.01	5.88	7.88	7.38	7.88	8.37	10.27	10.27
	Calistoga	1.30	1.85	3.02	2.28	2.91	3.36	4.00	3.69	1.58	2.75	.83	1.96	2.86	3.46	3.69	4.16	4.76	5.01	4.51	6.39	6.39	6.89	6.89	6.39	6.89	7.38	9.30	8.84
	Vacaville	4.16	4.51	4.16	4.76	2.86	3.02	3.85	3.36	3.25	1.07	2.75	1.69	1.69	2.59	2.59	3.36	3.69	4.16	3.69	5.88	5.26	5.88	6.89	6.39	6.89	7.88	9.32	9.32
	Oakland (1104)	4.16	3.69	3.00	3.46	2.22	1.80	2.80	1.58	4.00	3.36	3.36	2.38	1.79	1.24	1.94	1.32	2.31	1.73	1.87	3.52	3.33	4.74	5.01	4.31	5.01	5.26	7.38	7.38
	Richmond	3.69	3.15	2.49	2.97	1.69	1.25	2.28	1.01	3.56	3.07	2.80	1.85	1.47	.52	1.90	1.36	2.59	2.33	1.74	3.85	2.97	4.31	5.51	4.76	5.51	5.88	7.89	7.88
	Concord	4.16	4.51	3.85	4.31	2.59	2.59	3.46	2.49	3.69	2.86	2.97	1.90	1.19	1.52	.77	1.69	2.01	2.49	2.38	4.51	3.56	4.51	5.26	4.76	5.51	6.39	7.88	7.88
	Antioch	4.76	5.01	4.51	4.76	3.25	3.25	4.00	3.56	4.16	3.85	3.56	2.54	2.22	2.17	1.19	2.38	2.28	3.25	3.15	5.26	4.31	5.01	6.39	5.51	6.39	6.89	8.37	8.88
	Fremont (1803)	5.51	5.01	4.31	4.76	3.56	3.15	4.16	2.91	5.51	4.76	4.76	4.00	3.15	2.90	3.01	1.56	1.50	68	2.79	2.11	1.92	3.33	3.69	2.77	3.69	4.51	5.88	5.88
	San Mateo (407)	5.26	4.76	4.16	4.76	3.46	3.02	3.36	2.49	5.51	4.76	4.51	3.56	3.25	3.13	3.63	1.87	2.55	1.94	1.24	1.87	2.54	3.73	4.51	4.00	4.76	5.51	6.87	6.89
	Palo Alto (602)	5.51	5.51	4.76	5.26	4.16	3.69	4.00	3.15	6.39	5.51	5.26	4.31	3.85	3.73	4.14	2.38	2.71	1.75	1.91	1.33	2.00	3.18	4.00	3.36	4.00	4.31	6.39	6.39
	San Jose (2504)	6.39	5.88	5.26	5.88	4.51	4.16	5.01	4.16	6.39	5.88	5.88	5.01	4.16	3.67	3.58	2.28	2.07	1.62	2.78	1.23	92	2.39	2.75	2.17	2.97	3.85	5.26	5.26
	Santa Cruz	7.38	6.89	6.31	6.89	5.88	5.26	6.39	5.26	7.38	6.89	6.89	5.88	5.26	5.01	5.01	3.15	3.46	2.86	4.76	2.44	2.28	64	1.85	2.01	2.80	2.49	4.16	5.01
	Gilroy	7.38	6.89	6.39	6.89	5.88	5.26	6.39	5.88	7.38	5.26	6.89	5.88	5.26	4.76	5.01	3.15	3.46	2.80	4.76	2.75	1.80	2.38	1.19	46	1.36	2.33	3.69	3.85
	Monterey	9.32	8.84	8.37	8.84	7.88	7.38	8.37	7.38	9.32	8.84	8.84	7.88	7.38	6.89	6.89	5.26	5.51	4.76	6.39	4.76	3.85	2.97	2.38	2.65	2.54	.58	3.02	3.85
	Salinas	8.84	8.37	7.88	8.37	6.89	6.89	7.88	6.89	8.84	8.37	8.37	7.38	6.89	5.88	6.39	4.51	4.76	4.16	5.88	4.16	3.25	2.65	1.74	2.01	1.90	1.52	2.28	3.15
	Hollister	8.37	7.88	7.38	7.88	6.39	5.88	7.38	6.39	8.37	7.88	7.88	6.89	5.88	5.51	5.51	4.00	4.31	3.56	5.51	3.23	2.59	2.86	1.26	1.90	.39	2.31	3.69	3.07
	King City	10.75	10.75	7.80	10.27	9.32	8.84	9.80	9.32	11.23	10.27	10.27	9.80	8.84	8.37	8.37	6.89	6.89	6.39	8.37	6.39	5.51	5.01	4.16	4.31	4.31	3.56	1.01	.70

NOTE: The numbers and letters in parentheses [(104), (1–G)] refer to specific delivery centers and production areas listesd in MRT–20.

Table 1.3. Tolls in effect February 14, 1983, for round-trip travel on major San Francisco Bay area highway bridges.

Bridge	Truck Size → 3 axle	4 axle	5 axle	6 axle	7 axle
Golden Gate Bridge	$3.00	$4.50	$6.00	$7.50	$9.00
San Francisco-Oakland Bay Bridge	2.00	3.50	5.50	6.00	7.00
San Mateo-Hayward Bridge	2.00	3.00	4.00	5.00	6.00
Dumbarton Bridge	2.00	3.00	4.00	5.00	6.00
Richmond-San Rafael Bridge	3.50	5.00	6.00	7.00	8.00
Benicia-Martinez Bridge	2.00	3.50	4.75	5.50	6.00
Carquinez Bridge	2.00	3.50	4.75	5.50	6.00
Antioch Bridge	2.00	3.50	4.75	5.50	6.00

Source: California Department of Transportation, and Golden Gate Bridge and Highway District.

Additional P.C.C. aggregate is obtained from sand and gravel operations at Marina, Felton, King City, Gilroy, and Morgan Hill, and from crushed stone quarries at Aromas, Soquel, and Felton. This P-C region covers approximately 4,090 square miles, of which approximately 385 square miles were classified. The classified areas include portions of 34 quadrangles, and contains 26 active aggregate operations.

The boundaries of the P-C regions established for this study are presented on Plate 1.1. The locations of significant aggregate operations in all three P-C regions are shown on Plate 1.2. Plate 1.3 is an index map that shows the relationships of P-C boundaries to 7.5-minute quadrangle maps within the project area.

ESTABLISHMENT OF MINERAL RESOURCE ZONES

The State Geologist is responsible for classifying the urbanizing lands according to the presence or absence of significant sand, gravel, or stone deposits that are suitable as sources of aggregate. Mineral Resource Zones within each P-C region were established on the basis of a sand, gravel, or stone resource appraisal that included the following actions: a study of pertinent geologic reports and maps, field investigations and sampling at outcrops and active and inactive pits and quarries, and an analysis of waterwell logs and drill records. The Mineral Resource Zones (MRZ-1, MRZ-2, MRZ-3, MRZ-4) and Scientific Zones (SZ) that appear on quadrangle maps accompanying each P-C region report were determined on the basis of criteria set forth in the "Guidelines for Classification and Designation of Mineral Lands" (Appendix A-3).

The guidelines for establishing the Mineral Resource Zones are as follows:

(a) MRZ-1 — Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that little likelihood exists for their presence. This zone shall be applied where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is nil or slight.

(b) MRZ-2 — Areas where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. This zone shall be applied to known mineral deposits or where well-developed lines of reasoning, based upon economic-geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

(c) MRZ-3 — Areas containing mineral deposits, the significance of which cannot be evaluated from available data.

(d) MRZ-4 — Areas where available information is inadequate for assignment to any other MRZ zone.

(e) SZ — Areas containing unique or rare occurrence of rocks, minerals or fossils that are of outstanding scientific significance shall be classified in this zone.

The "Guidelines" set forth two requirements to be used to determine if land should be classified MRZ-2:

1. The deposit must be composed of material that is suitable as a marketable commodity.

2. The deposit must meet threshold value. The projected value (gross selling price) of the deposit, based on the value of the first marketable product, must be at least $5,000,000 (1978 dollars).

Table 1.4. Railroad freight rates for rock, sand and gravel in the San Francisco-Monterey Bay Region.

DELIVERY POINT / PRODUCTION AREA	San Francisco	Oakland	Redwood City	San Jose	Newark	Radum	Benicia	Vallejo	Black Point	Ignacio	Novato	San Rafael	Healdsburg
SPECIAL RATES (in dollars per carload)													
Logan (M.B.)			$223 (22) (C)	$207 (22) C									
Radum (S.S.F.B.)	$326 (10) (C)			$310 (10) (C)									
CARLOAD RATES (in dollars per ton)													
Radum (S.S.F.B.)	4.70	4.70 / 3.40 (10)(70T)	3.94 (90T) / 3.72 (10)(90T)	4.79 (90T) / 4.65 (10)(90T)	4.70								
Hollister (M.B.)	5.60 (70T) / 5.45 (10)(70T)		5.05 (G) (70T) / 4.08 (5) (50T)	3.80 (G) (70T) / 2.95 (5) (70T)	5.60 (70T) / 5.45 (10)(70K)								
Logan (M.B.)	5.74 (G) (70T) / 4.08 (10)(90T)	5.54 (G) (70T) / 5.20 (10)(70T)	3.72 (R) (70T) / 3.33 (10)(90T)	3.43 (70T) / 3.02 (10)(90T)	5.20 (10)(70T)		8.59	9.75		9.75			12.05
Olympia (M.B.)	8.00 (90T)	6.20 (50T)	7.44 (90T)	6.17 (90T)		5.96 (70T)							
Davenport (M.B.)			8.23	6.20	8.23	8.59	9.75	12.05					12.05
Healdsburg (N.S.F.B.)							9.02 / 7.69 (50T)	4.70 (5) (70T) / 4.56 (10)(70T)	6.20 / 3.87 (10)(70T)		4.07 (90T)	4.86 (90T)	

(M.B.) Monterey Bay P-C Region
(S.S.F.B.) South San Francisco Bay P-C Region
(N.S.F.B.) North San Francisco Bay P-C Region

(C) Company-owned cars only
(S) Sand only
(G) Gravel only
(R) Rock only
(90T) Minimum carload in tons
(10) Minimum number of cars in one shipment

Although not specified in the guidelines, the following criteria were applied to each deposit to test its suitability for inclusion in a MRZ-2 zone:

A. The presence of an operating quarry within the deposit is considered proof that Requirement 1 has been met.

B. An average value of $2.00 per ton (all aggregate) and a conversion factor of 2,500 tons per acre-foot of material (0.065 tons per cubic foot with ten per cent waste) requires a minimum amount of 1000 acre-feet of material within the deposit, exclusive of overburden and fill material, to meet the threshold value.

C. A deposit of aggregate material must have an overburden-to-ore ratio of less than 1 to 1 in order for material to be suitable for mining at the present time.

Specific criteria are discussed in detail in Parts II, III and IV of this report.

In the San Francisco - Monterey Bay area, classification was done with regard to the suitability of the underlying material for use as asphaltic concrete aggregate, road base, or subbase material, in addition to its use as Portland cement concrete aggregate. This classification project stands in contrast to the various P-C region studies underway in southern California where only P.C.C.-grade deposits were classified. This was done because of the relative scarcity of P.C.C.-grade sand and gravel in the Bay area and the resultant heavy dependence upon crushed stone deposits. If a deposit contained more than $5 million worth of material suitable for at least subbase aggregate, the deposit was classified MRZ-2.

CALCULATION OF AVAILABLE AGGREGATE RESOURCES

The State Geologist is responsible for calculating aggregate resources for those areas classified as MRZ-2. Recognizing that within MRZ-2 areas there are lands that have already been urbanized and that therefore have a limited opportunity for mineral resource conservation and extraction, the State Geologist has limited the calculation of aggregate resources tonnages to be portions of MRZ-2 areas that have not been urbanized.

Urbanized Versus Nonurbanized Land Uses

Because the Board's characterizations of compatible and incompatible land uses provide general guidance rather than specific criteria for labeling individual MRZ-2 areas, the State Geologist has adopted the terms *urbanized* and *nonurbanized* for application to the MRZ-2 areas under consideration in this report.

Urbanized land includes areas containing improvements of high cost, such as high-density residential developments, intensive industrial developments, commercial developments, and major public facilities.

Nonurbanized land includes very low-density residential land (approximately one unit or less per ten acres), recreational land that does not have high-cost improvements, agricultural land, silvicultural land, grazing land, and open space.

The determination of the above classifications for this report is based upon conditions of the land at the time of the study (1978 through May 1983). The use of the land was determined by the authors after consultations with lead agencies, and using aerial photographs, photo-revised topographic maps, and field reconnaissance.

The Concept of Sectors

In order to organize the volume calculations of the aggregate resources, the State Geologist has utilized the concept of "sectors" to identify those MRZ-2 areas that have not been urbanized (Appendix A-5). The geometrical configuration of the deposit in each sector is fairly uniform, so that tonnage of the mineral resource present can be calculated with some reliability. Thus, for example, sector boundaries would be established between that part of a natural deposit formed on a fan, and that part within the confines of an adjacent modern stream channel and its floodplain. The sector concept is used for the convenience of arraying resource information, and is intended to convey accurate information regarding the locations and approximate tonnage of resources found in nonurbanized areas.

Resource Sectors Within Parks

It is recognized that dedicated park lands have special status as opposed to other current uses of sectorized land; consequently, the resources within parks have been sectorized separately and the quantifications of those resources are presented separately in the tables. Resources within park sectors were quantified with less exactitude than was used in the resource calculations for other sectors.

50-YEAR FORECASTS

Basis of 50-Year Forecasts

The State Mining and Geology Board, as specified in Article II, Section I, 3c(2) of the "Guidelines for Classification and Designation of Mineral Land,"Appendix A-3 requires that mineral land classification reports for regions containing deposits of construction materials classified MRZ-2 include an estimate of the total quantity of each such construction material that will be needed to supply the requirements of the marketing region in which it occurs for the next 50 years. The marketing region is defined as the area within which such material is usually mined and marketed. The amount of each construction material needed for the next 50 years shall be projected using past consumption rates adjusted for anticipated changes in market conditions and mining technology. The "Guidelines" also require that these estimates be reviewed periodically (every ten years or less).

Fifty-year forecasts of aggregate needs were made on the basis of reported production of aggregate during the years 1953-1980. For the purposes of this project, it was assumed that all aggregate produced in a particular P-C region would be consumed within that region, unless it was known that aggregate is exported from or imported into the P-C region, and an estimate of the amount can be made. In such cases, the P-C region consumption figures were increased to reflect imports or reduced to reflect exports. When known exports/imports were less than about 5 percent of total aggregate production in a given P-C region, then consumption was defined as equalling production.

Aggregate consumption indicators

Relationships may exist between certain indicators and the amount of aggregate consumed in a P-C region. Indicators such as the number of new residential and non-residential building permits issued, miles of new highway constructed, number of non-agricultural employees, and population data were compared with aggregate production records.

Linear regression analyses showed that population was the only indicator to maintain a strong correlation with the amount of aggregate consumed in each of the P-C regions. Consequently, aggregate consumption rates for each year, in the form of per capita consumption, are computed by relating the annual population to annual total aggregate consumption in each P-C region.

Population and aggregate production data

A 28-year population record (1953-1980) was compiled for the three P-C regions. The historical population data for this period were obtained from statistical bulletins published by the California Department of Finance, county governments, and private organizations. Annual aggregate production data for the years 1953-1980 were obtained from records of the U.S. Bureau of Mines and from individual producers (see "Estimated 50-Year Consumption of Aggregate" sections in Part II, Part III, and Part IV of this report).

Per capita consumption of aggregate

Linear regression analyses of historical data were conducted to evaluate basic trends in the per capita consumption rates. The projected per capita consumption rates for each P-C region were then related to respective regional population projections on a basis to determine the total aggregate needs of each P-C region to the year 2030. Since the available population projections extended only to 2020, the population trend was extrapolated by DMG staff to the year 2030 and used to estimate the amount of aggregate needed in that decade. These figures were combined to estimate the total aggregate demand in each P-C region through the year 2030.

Per capita consumption rates vary among the different P-C regions of this study, apparently depending upon each region's degree of "urban maturity" (the point in the development of an area at which construction materials are used primarily to maintain what has already been developed, rather than to provide for further development). High per capita consumption rates are interpreted to be characteristic of P-C regions where overall population density is relatively low and where the rate of urban development appears to be high. A high consumption rate probably will be maintained within a P-C region until the onset of urban maturity, then decrease, and eventually drop to a general maintenance level.

REPORT SUMMARIES AND RECOMMENDATIONS

At the end of each P-C region report, findings are summarized and transmitted to the State Mining and Geology Board. The 50-year forecasts of aggregate consumption within a P-C region are compared with aggregate reserves estimated to be present and available within the P-C region. The possibility of utilizing reserves from adjacent P-C regions is considered. These facts are brought together by the Division of Mines and Geology in order that the lead agencies and the Mining and Geology Board can be apprised of options that are available to provide for future resource needs, and to enable the Board to develop alternative designation choices. Final determination of the areas to be designated will be made by the Board after consultation with lead agencies.

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APPENDIX A-1

Surface Mining And Reclamation Act Of 1975
(As amended by Senate Bill 1300, Nejedly - 1980 Statutes
and Assembly Bill 1110, Areias - 1984 Statutes)

SURFACE MINING AND RECLAMATION ACT OF 1975

(As amended by Senate Bill 1300, Nejedly - 1980 Statutes
and Assembly Bill 1110, Areias - 1984 Statutes)

Article 1. General Provisions

§2710. This chapter shall be known and may be cited as the Surface Mining and Reclamation Act of 1975.

§2711. (a) The Legislature hereby finds and declares that the extraction of minerals is essential to the continued economic well-being of the state and to the needs of the society, and that the reclamation of mined lands is necessary to prevent or minimize adverse effects on the environment and to protect the public health and safety.

(b) The Legislature further finds that the reclamation of mined lands as provided in this chapter will permit the continued mining of minerals and will provide for the protection and subsequent beneficial use of the mined and reclaimed land.

(c) The Legislature further finds that surface mining takes place in diverse areas where the geologic, topographic, climatic, biological, and social conditions are significantly different and that reclamation operations and the specifications therefor may vary accordingly.

§2712. It is the intent of the Legislature to create and maintain an effective and comprehensive surface mining and reclamation policy with regulation of surface mining operations so as to assure that:

(a) Adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adaptable for alternative land uses.

(b) The production and conservation of minerals are encouraged, while giving consideration to values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.

(c) Residual hazards to the public health and safety are eliminated.

§2713. It is not the intent of the Legislature by the enactment of this chapter to take private property for public use without payment of just compensation in violation of the California and United States Constitutions.

§2714. The provisions of this chapter shall not apply to any of the following activities:

(a) Excavations or grading conducted for farming or onsite construction or for the purpose of restoring land following a flood or natural disaster.

(b) Prospecting for, or the extraction of, minerals for commercial purposes and the removal of overburden in total amounts of less than 1,000 cubic yards in any one location of one acre or less.

(c) Surface mining operations that are required by federal law in order to protect a mining claim, if such operations are conducted solely for that purpose.

(d) Such other surface mining operations which the board determines to be of an infrequent nature and which involve only minor surface disturbances.

§2715. No provision of this chapter or any ruling, requirement, or policy of the board is a limitation on any of the following:

(a) On the police power of any city or county or on the power of any city or county to declare, prohibit, and abate nuisances.

(b) On the power of the Attorney General, at the request of the board, or upon his own motion, to bring an action in the name of the people of the State of California to enjoin any pollution or nuisance.

(c) On the power of any state agency in the enforcement or administration of any provision of law which it is specifically authorized or required to enforce or administer.

(d) On the right of any person to maintain at any time any appropriate action for relief against any private nuisance as defined in Part 3 (commencing with Section 3479) of Division 4 of the Civil Code or for any other private relief.

(e) On the power of any lead agency to adopt policies, standards, or regulations imposing additional requirements on any person if the requirements do not prevent the person from complying with the provisions of this chapter.

(f) On the power of any city or county to regulate the use of buildings, structures, and land as between industry, business, residents, open space (including agriculture, recreation, the enjoyment of scenic beauty, and the use of natural resources), and other purposes.

§2716. Any person may commence an action on his own behalf against the board or the State Geologist for a writ of mandate pursuant to Chapter 2 (commencing with Section 1084) of Title 1 of Part 3 of the Code of Civil Procedure to compel the board or the State Geologist to carry out any duty imposed upon them pursuant to the provisions of this chapter.

§2717. The board shall submit to the Legislature on December 1st of each year a report on the actions taken pursuant to this chapter during the preceding fiscal year. Such report shall include a statement of the actions, including legislative recommendations, which are necessary to carry out more completely the purposes and requirements of this chapter.

§2718. If any provision of this chapter or the application thereof to any person or circumstance is held invalid, such invalidity shall not affect other provisions or applications of the chapter which can be given effect without the invalid provision or application, and to this end the provisions of this chapter are severable.

Article 2. Definitions

§2725. Unless the context otherwise requires, the definitions set forth in this article shall govern the construction of this chapter.

§2726. "Area of regional significance" means an area designated by the board pursuant to Section 2790 which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs for minerals in a particular region of the state within which the minerals are located and which, if prematurely developed for alternate incompatible land uses, could result in the permanent loss of minerals that are of more than local significance.

§2727. "Area of statewide significance" means an area designated by the board pursuant to Section 2790 which is known to contain a deposit of minerals, the extraction of which is judged to be of prime importance in meeting future needs for minerals in the state and which, if prematurely developed for alternate incompatible land uses, could result in the permanent loss of minerals that are of more than local or regional significance.

§2728. "Lead agency" means the city or county which has the principal responsibility for approving a surface mining operation pursuant to this chapter or a public agency assigned responsibility for approving a surface mining operation pursuant to Section 2771.

§2729. "Mined lands" includes the surface, subsurface, and ground water of an area in which surface mining operations will be, are being, or have been conducted, including private ways and roads appurtenant to any such area, land excavations, workings, mining waste, and areas in which structures, facilities, equipment, machines, tools, or other materials or property which result from, or are used in, surface mining operations are located.

§2730. "Mining waste" includes the residual of soil, rock, mineral, liquid, vegetation, equipment, machines, tools, or other materials or property directly resulting from, or displaced by, surface mining operations.

§2731. "Operator" means any person who is engaged in surface mining operations, himself, or who contracts with others to conduct operations on his behalf, except a person who is engaged in surface mining operations as an employee with wages as his sole compensation.

§2732. "Overburden" means soil, rock, or other materials that lie above a natural mineral deposit or in between mineral deposits, before or after their removal by surface mining operations.

§2732.5. "Permit" means any authorization from, or approval by, a lead agency, the absence of which would preclude surface mining operations.

§2733. "Reclamation" means the combined process of land treatment that minimizes water degradation, air pollution, damage to aquatic or wildlife habitat, flooding, erosion, and other adverse effects from surface mining operations, including adverse surface effects incidental to underground mines, so that mined lands are reclaimed to a usable condition which is readily adaptable for alternate land uses and create no danger to public health or safety. The process may extend to affected lands surrounding mined lands, and may require backfilling, grading, resoiling, revegetation, soil compaction, stabilization, or other measures.

§2734. "State policy" means the regulations adopted by the board pursuant to Section 2755.

§2735. "Surface mining operations" means all, or any part of, the process involved in the mining of minerals on mined lands by removing overburden and mining directly from the mineral deposits, open-pit mining of minerals naturally exposed, mining by the auger method, dredging and quarrying, or surface work incident to an underground mine. Surface mining operations shall include, but are not limited to:

(a) Inplace distillation or retorting or leaching.

(b) The production and disposal of mining waste.

(c) Prospecting and exploratory activities.

Article 3. District Committees

§2740. In carrying out the provisions of this chapter, the board may establish districts and appoint one or more district technical advisory committees to advise the board. In establishing districts for these committees, the board shall take into account physical characteristics, including, but not limited to, climate, topography, geology, type of overburden, and principal mineral commodities. Members of the committees shall be selected and appointed on the basis of their professional qualifications and training in mineral resource conservation, development and utilization, land use planning, mineral economics, or the reclamation of mined lands.

§2741. The members of the committee shall receive no compensation for their services, but shall be entitled to their actual and necessary expenses incurred in the performance of their duties.

Article 4, State Policy for the Reclamation of Mined Lands

§2755. The board shall adopt regulations which establish state policy for the reclamation of mined lands in accordance with the general provisions set forth in Article 1 (commencing with Section 2710) of this chapter and pursuant to Chapter 4.5 (commencing with Section 11371) of Part 1 of Division 3 of Title 2 of the Government Code.

§2756. State policy shall apply to the conduct of surface mining operations and shall include, but shall not be limited to, measures to be employed by lead agencies in specifying grading, backfilling, resoiling, revegetation, soil compaction, and other reclamation requirements, and for soil erosion control, water quality and watershed control, waste disposal, and flood control.

§2757. The state policy adopted by the board shall be based upon a study of the factors that significantly affect the present and future condition of mined lands, and shall be used as standards by lead agencies in preparing specific and general plans, including the conservation and land use elements of the general plan, and zoning ordinances. The state policy shall not include aspects of regulating surface mining operations which are solely of local concern, and not of statewide or regional concern, as determined by the board, such as, but not limited to, hours of operation, noise, dust, fencing, and purely aesthetic considerations.

§2758. Such policy shall include objectives and criteria for all of the following:

(a) Determining the lead agency pursuant to the provisions of Section 2771.

(b) The orderly evaluation of reclamation plans.

(c) Determining the circumstances, if any, under which the approval of a proposed surface mining operation by a lead agency need not be conditioned on a guarantee assuring reclamation of the mined lands.

§2759. The state policy shall be continuously reviewed and may be revised. During the formulation or revision of such policy, the board shall consult with, and carefully evaluate the recommendations of, the State Geologist, any district technical advisory committees, concerned federal, state, and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals.

§2760. The board shall not adopt or revise the state policy unless a public hearing is first held respecting their adoption or revision. At least 30 days prior to such hearing, the board shall give notice of the hearing by publication pursuant to Section 6061 of the Government Code.

§2761. (a) On or before January 1, 1977, and, as a minimum, after the completion of each decennial census, the Office of Planning and Research shall identify portions of the following areas within the state which are urbanized or are subject to urban expansion or other irreversible land uses which would preclude mineral extraction.

(1) Standard metropolitan statistical areas and such other areas for which information is readily available.

(2) Other areas as may be requested by the board.

(b) In accordance with a time schedule, and based upon guidelines adopted by the board, the State Geologist shall classify, on the basis solely of geologic factors, and without regard to existing land use and land ownership, the areas identified by the Office of Planning and Research, any area for which classification has been requested by a petition which has been accepted by the board, or any other areas as may be specified by the board, as one of the following:

(1) Areas containing little or no mineral deposits.

(2) Areas containing significant mineral deposits.

(3) Areas containing mineral deposits, the significance of which requires further evaluation.

(c) As it is completed by county, the State Geologist shall transmit such information to the board for incorporation into the state policy and for transmittal to lead agencies.

§2762. (a) Within 12 months of receiving the mineral information described in Section 2761, and also within 12 months of the designation of an area of statewide or regional significance within its jurisdiction, every lead agency shall, in accordance with state policy, establish mineral resource management policies to be incorporated in its general plan which will:

(1) Recognize mineral information classified by the State Geologist and transmitted by the board.

(2) Assist in the management of land use which affect areas of statewide and regional significance.

(3) Emphasize the conservation and development of identified mineral deposits.

(b) Every lead agency shall submit proposed mineral resource management policies to the board for review and comment prior to adoption.

(c) Any subsequent amendment of the mineral resource management policy previously reviewed by the board shall also require review and comment by the board.

(d) Prior to permitting a use which would threaten the potential to extract minerals in an area classified by the State Geologist as an area described in paragraph (3) of subdivision (b) of Section 2761, the lead agency may cause to be prepared an evaluation of the area in order to ascertain the significance of the mineral deposit located therein. The results of such evaluation shall be transmitted to the State Geologist and the board.

§2763. (a) Lead agency land use decisions involving areas designated as being of regional significance shall be in accordance with the lead agency's mineral resource management policies and shall also, in balancing mineral values against alternative land uses, consider the importance of these minerals to their market region as a whole and not just their importance to the lead agency's area of jurisdiction.

(b) Lead agency land use decisions involving areas designated as being of statewide significance shall be in accordance with the lead agency's mineral resource management policies and shall also, in balancing mineral values against alternative land uses, consider the importance of the mineral resources to the state and nation as a whole.

Article 5. Reclamation Plans and the Conduct of Surface Mining Operations

§2770. Except as specified in Section 2774.5 and 2776, no person shall conduct surface mining operations unless a permit is obtained from, and a reclamation plan has been submitted to, and approved by, the lead agency for such operation pursuant to this article.

§2770.5. Whenever surface mining operations are proposed in the 100-year flood plain for any stream, as shown in Zone A of Flood Insurance Rate Maps issued by the Federal Emergency Management Agency, and within one mile, upstream or downstream, of any state highway bridge, the lead agency receiving the application for the issuance or renewal of a permit to conduct the surface mining operations shall notify the Department of Transportation that the application has been received. The Department of Transportation shall have a period of not more than 45 days to review and comment on the proposed surface mining operations with respect to any potential damage to the state highway bridge from the proposed surface mining operations. The lead agency shall not issue or renew the permit until the Department of Transportation has submitted its comments or until 45 days from the date the application for the permit was submitted, whichever occurs first.

§2771. Whenever a proposed surface mining operation is within the jurisdiction of two or more public agencies, is a permitted use within the agencies, and is not separated by a natural or manmade barrier coinciding with the boundary of the agencies, the evaluation of the proposed operation shall be made by the lead agency in accordance with the procedures adopted by the lead agency pursuant to Section 2774. In the event that a dispute arises as to which public agency is the lead agency, any public agency which is a party to the dispute may submit the matter to the board; and the board shall designate the public agency which shall serve as the lead agency, giving due consideration to the capability of such agency to fulfill adequately the requirements of this chapter and to an examination of which of the public agencies has principal permit responsibility.

§2772. The reclamation plan shall be filed with the lead agency on a form provided by the lead agency, by any person who owns, leases, or otherwise controls or operates on all, or any portion of any, mined lands, and who plans to conduct surface mining operations thereon.

The reclamation plan shall include the following information and documents:

(a) The name and address of the operator and the names and addresses of any persons designated by him as his agents for the service of process.

(b) The anticipated quantity and type of minerals for which the surface mining operation is to be conducted.

(c) The proposed dates for the initiation and termination of such operation.

(d) The maximum anticipated depth of the surface mining operation.

(e) The size and legal description of the lands that will be affected by such operation, a map that includes the boundaries and topographic details of such lands, a description of the general geology of the area, a detailed description of the geology of the area in which surface mining is to be conducted, the location of all streams, roads, railroads, and utility facilities within, or adjacent to, such lands, the location of all proposed access roads to be constructed in conducting such operation, and the names and addresses of the owners of all surface and mineral interests of such lands.

(f) A description of and plan for the type of surface mining to be employed and a time schedule that will provide for the completion of surface mining on each segment of the mined lands so that reclamation can be initiated at the earliest possible time on those portions of the mined lands that will not be subject to further disturbance by the surface mining operation.

(g) A description of the proposed use or potential uses of the land after reclamation and evidence that all owners of a possessory interest in the land have been notified of the proposed use or potential uses.

(h) A description of the manner in which reclamation, adequate for the proposed use or potential uses will be accomplished, including:

(1) a description of the manner in which contaminants will be controlled, and mining waste will be disposed; and

(2) a description of the manner in which rehabilitation of affected streambed channels and streambanks to a condition minimizing erosion and sedimentation will occur.

(i) An assessment of the effect of implementation of the reclamation plan on future mining in the area.

(j) A statement that the person submitting the plan accepts responsibility for reclaiming the mined lands in accordance with the reclamation plan.

(k) Any other information which the lead agency may require by ordinance.

§2773. The reclamation plan shall be applicable to a specific piece of property or properties, and shall be based upon the character of the surrounding area and such characteristics of the property as type of overburden, soil stability, topography, geology, climate, stream characteristics, and principal mineral commodities.

§2774. (a) Every lead agency shall adopt ordinances in accordance with state policy which establish procedures for the review and approval of reclamation plans and the issuance of a permit to conduct surface mining operations, except that any lead agency without an active surface mining operation in its jurisdiction may defer adopting an implementing ordinance until the filing of a permit application. Such reclamation and permit ordinances shall establish procedures requiring at least one public hearing and periodic inspections of surface mining operations, and may include provisions for liens, surety bonds, or other security to guarantee reclamation in accordance with the reclamation plan. Such ordinances shall be periodically reviewed by the lead agency and revised, as necessary, in order to ensure that the ordinances continue to be in accordance with state policy.

(b) Lead agencies shall notify the State Geologist of the filing of an application for a permit to conduct surface mining operations.

(c) On request of a lead agency, the State Geologist shall furnish technical assistance to assist in the review of reclamation plans.

§2774.3 (a) The board shall, in accordance with a time schedule, review lead agency ordinances which establish permit and reclamation procedures to determine whether each such ordinance is in accordance with state policy, and shall certify the ordinance as being in accordance with state policy if it adequately meets, or imposes requirements more stringent than, the California surface mining and reclamation policies and procedures established by the board pursuant to this chapter. The board shall complete on or before January 1, 1982, a review of all such ordinances adopted prior to November 1, 1981.

(b) Lead agencies shall submit ordinances adopted on or after November 1, 1981, which establish permit and reclamation procedures to the board for such determination and certification, and no such ordinance shall take effect until the board has certified that the ordinance is in accordance with state policy. Such review for certification shall be completed by the board within 60 days of the date of submittal to the board.

§2774.5 (a) If, upon review of an ordinance, the board finds that it is not in accordance with state policy, the board shall communicate the ordinance's deficiencies in writing to the lead agency. Upon receipt of such a written communication, the lead agency shall have 90 days to submit a revised ordinance to the board for certification as being in accordance with state policy. The board shall review the lead agency's revised ordinance for certification within 60 days of its receipt. If the lead agency does not submit a revised ordinance within 90 days, the board shall assume full authority for reviewing and approving reclamation plans submitted to the lead agency until such time as the lead agency's ordinances are revised in accordance with state policy.

(b) If, upon review of a lead agency's revised ordinance, the board finds the ordinance is still not in accordance with state policy, the board shall again communicate the ordinance's deficiencies in writing to the lead agency. The lead agency shall have a second 90-day period in which to revise the ordinance and submit it to the board for review. If the board again finds that the revised ordinance is not in accordance with state policy or if no revision is submitted, the board shall assume full authority for reviewing and approving reclamation plans submitted to the lead agency until such time as the lead agency's ordinances are revised in accordance with state policy.

(c) On and after November 1, 1981, in any jurisdiction in which the lead agency does not have a certified ordinance, no person shall initiate a surface mining operation unless a reclamation plan has been submitted to, and approved by, the board. Any reclamation plan, approved by a lead agency under the provisions of a lead agency's ordinance which was not in accordance with state policy at the time of approval, shall be subject to amendment by the board or under the provisions of an ordinance certified by the board as being in accordance with state policy.

(d) Reclamation plans approved by the board pursuant to this section shall not be subject to modification by the lead agency at a future date but may be amended by the board. Nothing in this section shall be construed as authorizing the board to issue a permit for the conduct of mining operations.

§2775. (a) An applicant whose request for a permit to conduct surface mining operations in an area of statewide or regional significance has been denied by a lead agency, or any person who is aggrieved by the granting of a permit to conduct surface mining operations in an area of statewide or regional significance, may, within 15 days of exhausting his rights to appeal in accordance with the procedures of the lead agency, appeal to the board.

(b) The board may, by regulation, establish procedures for declining to hear appeals that it determines raise no substantial issues.

(c) Appeals that the board does not decline to hear shall be scheduled and heard at a public hearing held within the jurisdiction of the lead agency which processed the original application within 30 days of the filing of the appeal, or such longer period as may be mutually agreed upon by the board and the person filing the appeal. In any such action, the board shall not exercise its independent judgment on the evidence but shall only determine whether the decision of the lead agency is supported by substantial evidence in the light of the whole record. If the board determines the decision of the lead agency is not supported by substantial evidence in the light of the whole record it shall remand the appeal to the lead agency and the lead agency shall schedule a public hearing to reconsider its action.

§2776. No person who has obtained a vested right to conduct surface mining operations prior to January 1, 1976, shall be required to secure a permit pursuant to the provisions of this chapter as long as such vested right continues; provided, however, that no substantial changes may be made in any such operation except in accordance with the provisions of this chapter. A person shall be deemed to have such vested rights if, prior to January 1, 1976, he has, in good faith and in reliance upon a

permit or other authorization, if such permit or other authorization was required, diligently commenced surface mining operations and incurred substantial liabilities for work and materials necessary therefor. Expenses incurred in obtaining the enactment of an ordinance in relation to a particular operation or the issuance of a permit shall not be deemed liabilities for work or materials.

A person who has obtained a vested right to conduct surface mining operations prior to January 1, 1976, shall submit to the lead agency and receive, within a reasonable period of time, approval of a reclamation plan for operations to be conducted after January 1, 1976, unless a reclamation plan was approved by the lead agency prior to January 1, 1976 and the person submitting the plan has accepted responsibility for reclaiming the mined lands in accordance with the reclamation plan.

Nothing in this chapter shall be construed as requiring the filing of a reclamation plan for, or the reclamation of, mined lands on which surface mining operations were conducted prior to January 1, 1976.

§2777. Amendments to an approved reclamation plan may be submitted detailing proposed changes from the original plan. Substantial deviations from the original plan shall not be undertaken until such amendment has been filed with, and approved by, the lead agency.

§2778. Reclamation plans, reports, applications, and other documents submitted pursuant to this chapter are public records, unless it can be demonstrated to the satisfaction of the lead agency that the release of such information, or part thereof, would reveal production, reserves, or rate of depletion entitled to protection as proprietary information. The lead agency shall identify such proprietary information as a separate part of the application. Proprietary information shall be made available only to the State Geologist and to persons authorized in writing by the operator and by the owner.

A copy of all reclamation plans, reports, applications, and other documents submitted pursuant to this chapter shall be furnished to the State Geologist by lead agencies on request.

§2779. Whenever one operator succeeds to the interest of another in any incompleted surface mining operation by sale, assignment, transfer, conveyance, exchange, or other means, the successor shall be bound by the provisions of the approved reclamation plan and the provisions of this chapter.

Article 6. Areas of Statewide or Regional Significance

§2790. After receipt of mineral information from the State Geologist pursuant to subdivision (c) of Section 2761, the board may by regulation adopted after a public hearing designate specific geographic areas of the state as areas of statewide or regional significance and specify the boundaries thereof. Such designation shall be included as a part of the state policy and shall indicate the reason for which the particular area designated is of significance to the state or region, the adverse effects that might result from premature development of incompatible land uses, the advantages that might be achieved from extraction of the minerals of the area, and the specific goals and policies to protect against the premature incompatible development of the area.

§2791. The board shall seek the recommendations of concerned federal, state, and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals in the identification of areas of statewide and regional significance.

§2792. Neither the designation of an area of regional or statewide significance nor the adoption of any regulations for such an area shall in any way limit or modify the rights of any person to complete any development that has been authorized pursuant to Part 2 (commencing with Section 11000) of Division 4 of the Business and Professions Code, pursuant to the Subdivision Map Act (Division 2 [commencing with Section 66410] of Title 7 of the Government Code), or by a building permit or other authorization to commence development, upon which such person relies and has changed his position to his substantial detriment, and, which permit or authorization was issued prior to the designation of such area pursuant to Section 2790. If a developer has by his actions taken in reliance upon prior regulations obtained vested or other legal rights that in law would have prevented a local public agency from changing such regulations in a way adverse to his interests, nothing in this chapter authorizes any governmental agency to abridge those rights.

§2793. The board may, by regulation adopted after a public hearing, terminate, partially or wholly, the designation of any area of statewide or regional significance on a finding that the direct involvement of the board is no longer required.

Article 7. Fiscal Provisions

§2795. (a) Notwithstanding any other provision of law, the first one million one hundred thousand dollars ($1,100,000) of moneys from mining activities on federal lands disbursed by the United States each fiscal year to this state pursuant to Section 35 of the Mineral Lands Leasing Act, as amended (30 U.S.C. Sec. 191), shall be deposited in the Surface Mining and Reclamation Account in the General Fund, which account is hereby created, and may be expended, upon appropriation by the Legislature, for the purposes of this chapter.

(b) Proposed expenditures from the account shall be included in a separate item in the Budget Bill for each fiscal year for consideration by the Legislature. Each appropriation from the account shall be subject to all of the limitations contained in the Budget Act and to all other fiscal procedures prescribed by law with respect to the expenditure of state funds. On June 30 of each year any portion of the one million one hundred thousand dollars ($1,100,000) specified in subdivision (a) for that fiscal year which is not appropriated by the Legislature shall be transferred to unappropriated surplus of the General Fund.

APPENDIX A-2

State Mining And Geology Board Resolution 22
and 82-14.

STATE MINING AND GEOLOGY BOARD

State of California

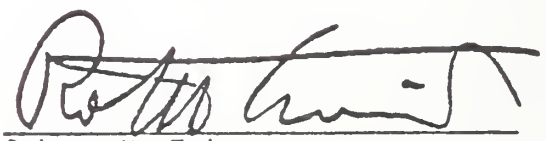
RESOLUTION NO. 22

WHEREAS the Board recognizes the importance of prioritizing classification projects so that potential mineral lands that are most likely to be converted to uses that are incompatible with mining are classified first (In conformance with Section 2761(b) of the Surface Mining and Reclamation Act of 1975 (SMARA) and the Guidelines for Classification and Designation of Mineral Lands adopted by the Board on June 30, 1978) and,

WHEREAS the Board recognizes the importance of periodically reviewing classification priorities to insure that the mineral resource conservation objectives of SMARA and the Board's guidelines are being met within existing funding and staffing constraints,

THEREFORE be it resolved that the prioritized list of mineral lands classification projects as adopted on January 13, 1978 be revised. The revised list as attached separates urban from non-urban and other areas for classification purposes. Priority is to be given to urban areas and their geographical subdivisions.

ADOPTED: November 2, 1978



Robert H. Twiss
Chairman

November 2, 1978

Priorities for Mineral Lands Classification

I. Urban Areas

Priority 1

A. Greater Los Angeles Basin
B. East San Francisco Bay Counties

Priority 2

A. South, West and North San Francisco Bay Counties
B. Sacramento - San Joaquin Valley Urbanizing Areas

Priority 3

A. Western San Diego County
B. Coastal Ventura and Santa Barbara County Areas
C. Solano-Napa-Yolo Urbanizing Areas
D. Bakersfield and Palmdale Areas
E. San Luis Obispo - Santa Maria Area
F. Fresno Area

II. Non-Urban And Other Areas Not Covered Above

Priority 1

California Desert Conservation Area (CDCA)

Priority 2

Forest Lands - RARE II Areas

Priority 3

Other Areas

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION

STATE MINING AND GEOLOGY BOARD

610 BERCUT DRIVE
SACRAMENTO 95814

RESOLUTION #82-14

Priorities for the Classification of Mineral Lands in Urban and Nonurban Areas

The Mining and Geology Board, at its July 23, 1982, meeting, approved the Division of Mines and Geology's proposed schedule of priorities for its urban and nonurban classification programs.

This action superceded priorities previously established for the urban classification program on November 2, 1978 (Resolution 22), and later changed on May 25, 1979 (Resolution 33). Priorities for the nonurban program were established November 2, 1978 (Resolution 22), and later changed on March 21, 1981 (Resolution 81-3).

THE BOARD HEREIN RESOLVES to adopt the following schedule of priorities for the classification of mineral lands in urban and nonurban areas of the State. The order of listing under each priority group does not imply the order of work or completion of individual study areas.

Urban Classification Program

Priority I Areas:

San Diego
San Francisco, Part I

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Priorities for the Classification
of Mineral Lands in Urban and
Nonurban Areas
Page 2 of 2

San Francisco, Part II
San Francisco, Part III
San Francisco, Part IV
Claremont-Upland
San Bernardino
Saugus-Newhall-Palmdale

Priority II Areas:

Sacramento-Fairfield-Yolo
San Luis Obispo-Santa Maria
Bakersfield
Fresno
Yuba City-Marysville
Modesto
Stockton-Lodi
Santa Barbara
Foothill Belt

Priority III Areas:

Merced
Visalia
Redding-Red Bluff
Palm Springs
Brawley-El Centro
Barstow-Victorville
Eureka

Nonurban Classification Program

Priority I Areas:

Foothill Belt of the Sierra Nevada
California Desert Conservation Area

Priority II Areas:

Other areas not covered by Urban Classification Program

THE BOARD FURTHER RESOLVES that Resolutions 22, 33, and 81-3 are hereby superceded by this action.

Tito Patri
Chairman

ADOPTED: November 15, 1982

APPENDIX A-3

State Mining And Geology Board Guidelines For
Classification And Designation Of Mineral Lands

EDMUND G BROWN JR
GOVERNOR OF CALIFORNIA

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION
STATE MINING AND GEOLOGY BOARD
1335 RESOURCES BUILDING
1416 - 9TH STREET, SACRAMENTO 95814
(916) 322-1082

July 13, 1978

SUBJECT: Guidelines for Classification and Designation of Mineral Lands

The Surface Mining and Reclamation Act of 1975 (SMARA) requires the State Mining and Geology Board to adopt state policies relative to mineral resource production and conservation.

Pursuant to this requirement the Board adopted the Guidelines for Classification and Designation of Mineral Lands following a June 30, 1978 public hearing held in Sacramento. A copy of these Guidelines is attached for your information.

The Board has not yet adopted a policy on California Environmental Quality Act (CEQA) compliance as it relates to designation of mineral lands, page 17 of the Guidelines. In considering such a policy the Board will be guided by the Attorney General's Opinion SO 78/5 IL of June 19, 1978 which states that:

1. The designation by the State Mining and Geology Board of an area as being of regional or statewide significance is an activity which requires compliance with CEQA and an environmental impact report will be required if the designation may have a significant effect on the environment.

2. The State Mining and Geology Board is the appropriate lead agency for preparing environmental documents relating to the designation of mineral lands.

Questions concerning SMARA and Board policies should be directed to D.W. Sprague, Special Representative to the Board, (916) 322-1082.

Robert H. Twiss

Robert H. Twiss
Chairman

Attachment

GUIDELINES

FOR

CLASSIFICATION AND DESIGNATION OF MINERAL LANDS

Prepared By

The State Mining and Geology Board
1416 Ninth Street, Room 1335
Sacramento, California 95814

Robert H. Twiss, Chairman
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Ta-Liang Teng

PART II
GUIDELINES FOR CLASSIFICATION AND DESIGNATION OF MINERAL LANDS

PREFACE

The Surface Mining and Reclamation Act of 1975, enacted as Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board to adopt state policies relative to mineral resource production and conservation.

Pursuant to this requirement the Board adopted the Guidelines for Classification and Designation of Mineral Lands following a June 30, 1978 public hearing held in Sacramento, California.

CHAPTER 8. MINING AND GEOLOGY

SUBCHAPTER 1. State Mining and Geology Board

Article II. GUIDELINES FOR CLASSIFICATION AND DESIGNATION OF MINERAL LANDS

INTRODUCTION—The purpose of these guidelines is to implement the Surface Mining and Reclamation Act of 1975 by providing direction to the State Geologist in carrying out mineral resource classification of lands in California that are threatened by uses which would be incompatible with or would preclude mining. In addition, these guidelines establish procedures by which the State Mining and Geology Board may designate mineral-bearing areas of statewide or of regional significance.

Classification is the process of identification of lands containing significant mineral deposits. *Designation* is the formal recognition by the Board, after consultation with lead agencies and other interested parties, of areas containing mineral deposits of regional or statewide significance that should be protected from land uses incompatible with mineral extraction. The objective of the classification and designation processes is to insure, through appropriate lead agency policies and procedures, that mineral deposits of statewide or of regional significance are available when needed.

It is the Board's intention to review the guidelines from time to time and to revise them as necessary.

SECTION I. GUIDELINES FOR CLASSIFICATION OF MINERAL LANDS

1. *Classification Criteria*

(a) In accordance with these guidelines and a schedule adopted by the Board, the State Geologist shall classify areas of the State threatened by land uses incompatible with, or that would preclude, mining. Such areas will be classified into Mineral Resource Zones (MRZ) and Scientific Resource Zones (SZ), as defined in this section, and shall be based on geologic and economic factors without regard to existing land use and land ownership. The areas to be studied and their order of study shall be specified by the Board in consultation with the State Geologist.

(b) To be considered significant for the purpose of the classification of mineral lands, a mineral deposit, or a group of deposits that can be mined as a unit must meet the following criteria of marketability and threshold value. In these guidelines the term *mineral deposits* denotes natural occurrences of rock or mineral materials in or on the earth's crust that are known to be economically minable and such rock or mineral materials that are not minable at present but which may come into such demand as to become economically minable in the foreseeable future. The term *mineral resources* is used herein as a collective term for all mineral deposits of a particular kind, or for mineral deposits in general. The size of mineral deposits for the purpose of evaluating marketability and threshold value shall include the amounts of naturally occurring rock or mineral material, of known or potential economic interest, that can be measured, indicated, or inferred by using available geologic and geophysical evidence in commonly accepted fashion. The terms *measured, indicated,* and *inferred* are to be used as defined by the U.S. Bureau of Mines and the U.S. Geological Survey in U.S. Geological Survey Bulletin 1450-A.

(1) *Marketability*—In determining marketability, mineral deposits shall be divided into two categories, those containing non-strategic and those containing strategic mineral commodities. Unique or rare occurrences of rocks, minerals or fossils that are of outstanding scientific significance are not required to meet marketability criteria.

(i) *Non-strategic mineral commodities* are those which are available domestically and of which the United States imports less than 65 percent of its needs as reported annually by the U.S. Bureau of Mines. Deposits of mineral commodities in this category must be minable, processable, and marketable under the technologic and economic conditions that exist at present or which can be estimated to exist in the foreseeable future. The amount of mineral resources needed for periods of the foreseeable future (50 years) shall be projected using past consumption figures, with appropriate adjustments based upon anticipated changes in market conditions and mining technology.

(ii) *Strategic mineral commodities* are those that are in short domestic supply and important for national defense or the well-being of the domestic economy. For the purposes of these guidelines they are those mineral commodities of which the United States imports more than 65 percent of its needs, as reported annually by the U.S. Bureau of Mines, that are judged to be minable, processable, and marketable in the foreseeable future if non-domestic sources of supply are cut off.

(iii) *Foreseeable future,* as used in this paragraph and elsewhere in the guidelines is a time span of approximately 50 years. Because some of the conditions affecting extraction and marketability cannot be accurately projected 50 years into the future, conservative estimates shall be made in assessing whether a particular mineral resource can be mined, processed and marketed within the next 50 years.

(2) *Threshold value* is the projected value (gross selling price) of the first marketable product from an individual mineral deposit or from a group of deposits that can be operated as a unit, upon completion of extraction and any required mineral separation and processing. For those deposits which meet the marketability criteria, only those estimated to exceed the following threshold values in 1978 —equivalent dollars shall be considered significant. These threshold values are intended to indicate in a general way the approximate minimum size of a mineral deposit that will be considered significant for classification and designation. They are not intended, nor in practice could they be, for use as precise cut off values. For some deposits in some areas larger or smaller value than those specified would be required for a marketable deposit. If for technological or other reasons one or more parts of a mineral deposit cannot meet the marketability criteria, those parts shall not be considered in estimating whether the deposit exceeds the threshold value.

(i) *Construction materials* (minimum value $5,000,000)—Mineral materials capable of being used in construction, such as sand and gravel or crushed rock, which normally receive minimal processing, commonly washing and grading, and for which the ratio of transportation costs to value of the processed material at the mine is high.

(ii) *Industrial and chemical mineral materials* (minimum value $1,000,000)—Non-metallic mineral materials that normally receive extensive processing, such as heat or chemical treatment or fine sizing, and for which the ratio of transportation costs to value of the material at the mine is moderate or low. Examples of this category include:

Limestone, dolomite, and marble except where used as construction aggregate
Specialty sands
Clays
Diatomite
Phosphate
Coal, Lignite, or peat mined primarily as a raw material for chemicals such as montan wax
Salines and evaporate such as borates and gypsum
Feldspar
Talc
Building and dimension stone
Asbestos
Rock varieties producible into granules, rock flour, mineral wool, expanded shale, pozzolans and other similar commodities

(iii) *Metallic and rare minerals* (minimum value $500,000)—Metallic elements and minerals, gemstones, and minerals that possess special properties valuable to science or industry. The ratio of transportation costs to the value of the material at the mine for this category is low. Examples include ores, deposits or crystals of:

Precious metals (gold, silver, platinum)
Iron and other ferro alloy metals (iron, tungsten, chromium, manganese)
Base metals (copper, lead, zinc)
Mercury
Uranium and thorium except syngenetic deposits in shale
Rare earths
Minor metals including rubidium and cesium
Gemstones and semi-precious materials
Niobium, tantallium
Optical grade calcite

(iiii) *Non-fluid mineral fuels* (minimum value $1,000,000)—Non-hydrothermal mineral fuels occurring in sedimentary rocks. Examples include:

Coal
Lignite
Peat
Organic shale
Tar sand
Uranium and thorium (syngenetic deposits in shale)

(iiiii) *Unique or rare occurences of rocks, minerals, or fossils* that are of outstanding scientific significance (no threshold value).

2. *Mineral Resource Zones (MRZ) and Scientific Resource Zones (SZ)*

The following MRZ and SZ categories shall be used by the State Geologist in classifying the State's lands. The geologic and economic data and the arguments upon which each unit MRZ or SZ assignment is based shall be presented in the land classification information transmitted by the State Geologist to the Board.

(a) *MRZ-1* Areas where adequate information indicates that no significant mineral deposits are present, or where it is judged that there is little likelihood exists for their presence. This zone shall be applied where well developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is nil or slight.

(b) *MRZ-2* Areas where adequate information indicates that significant mineral deposits are present or where it is judged that there is a high likelihood for their presence exists. This zone shall be applied to known mineral deposits or where well developed lines of reasoning, based upon economic geologic principles and adequate data, demonstrate that the likelihood for occurrence of significant mineral deposits is high.

(c) *MRZ-3* Areas containing mineral deposits the significance of which cannot be evaluated from available data.

(d) *MRZ-4* Areas where available information is inadequate for assignment to any other MRZ zone.

(e) *SZ* Areas containing unique or rare occurrences of rocks, minerals or fossils that are of outstanding scientific significance shall be classified in this zone.

3. *Documentation and Transmittal of Mineral Lands Classification Data*

(a) Areas assigned by the State Geologist to mineral resource zones shall be delineated on suitable maps of a scale adequate for use on lead agency general plan maps. These maps shall also show the boundaries of each permitting authority in the report area.

(b) A map at a convenience scale and a summary report showing the mineral lands classification for an entire county or, at the direction of the Board, major subdivisions of a county, or a major mineral district that includes portions of two or more counties, shall be prepared after classification is complete. Each map and report shall be submitted to the

Board which, after review and approval, shall transmit it to the appropriate lead agencies and make it available to other interested parties.

(c) Mineral land classification reports of regions containing *Construction Materials* classified *MRZ-2* shall include the following additional information for each such mineral commodity:

(1) The location and an estimate of the total quantity of each such construction material that is geologically available for mining in the report region. The limits of the region shall be considered to be the consumption areas for each potentially producible construction mineral commodity under consideration.

(2) An estimate of the total quantity of each such construction material that will be needed to supply the requirements of both the county and the marketing region in which it occurs for the next 50 years. The marketing region is defined as the area within which such material is usually mined and marketed. The amount of each construction material mineral resource needed for the next 50 years shall be projected using past consumption rates adjusted for anticipated changes in market conditions and mining technology. These estimates shall be periodically reviewed as provided in Section 1, Subsection 7.

4. *Classification Priorities*

Potential mineral lands that are most likely to be converted to uses that are incompatible with mining or which would preclude mining shall be classified first. Where the risk of conversion to incompatible land uses is equal, those areas with mineral deposits of greatest statewide or regional significance shall be classified first. The potential for loss may be through the process of urbanization or through other irreversible uses of the mineral lands or of adjoining lands, with which mineral extraction would be incompatible.

5. *Petitions for Mineral Lands Classification*

(a) Petitions may be brought before the Board by any individual or organization to classify mineral lands that are claimed to contain significant mineral deposits and which are claimed to be threatened by land uses incompatible with mining. Classification is a prerequisite to designation of regional or statewide significance. Once an area is classified as MRZ-2, or SZ, a petition may be submitted for designation consideration under Section II, Subsection 4. If a petitioner can supply sufficient geologic and economic data to support an MRZ-2 or SZ classification by the State Geologist, he may also petition the Board to consider designation. It is expected that such a joint petition will include detailed information, and supportive data on the amounts and value of mineral deposits claimed to be MRZ-2 or SZ and other information required under Section II, Subsection 4, Petitions for Designation. The threat to a mineral deposit may be due to incompatible uses of adjoining lands that would preclude mining, as well as to mineral lands themselves. Petitions submitted to the Board shall include the following information.

(1) The petitioner's name, mailing address, and interest (beneficial, jurisdictional, or other) in the area to be considered for classification.

(2) A map (USGS 7½′ quadrangle or other appropriate map) showing the boundaries of the area the petitioner wishes to be classified.

(3) A description of the significant mineral deposits claimed to occur within the area described, including sufficient geologic and economic data to support the claim that the mineral deposits are significant as defined in these guidelines.

(4) The imminency of the threatened change, if any, in the use of land containing the claimed significant mineral deposits to a use which would prevent their mining. The petitioner should be prepared to supply full documentation if requested.

(5) The name and mailing address of each recorded land owner and each recorded lessee in and adjoining the area described.

(b) The State Geologist shall make an evaluation of the data submitted in the petition as to its accuracy and sufficiency and determine if the area can be classified on the basis of both submitted and other readily available information. A recommendation shall be then submitted to the Board concerning:

(1) The urgency of the requested classification.

(2) The sufficiency of the submitted and other readily available data as a basis for classification, and the scope of any additional investigation required.

(3) An estimation of the time required to classify the area.

(c) Following the State Geologist's report, the Board shall determine the prioroity for classification of the land described in the petition in relation to other areas in the State's mineral lands classification program. Classification of the area will then proceed according to its assigned priority.

6. *Lead Agency Responsibilities*

(a) Within 12 months of receiving the mineral lands classification map and report, every lead agency shall, in accordance with state policy, develop and adopt mineral resource management policies to be incorporated in its general plan which will:

(1) Recognize the mineral classification information, including the classification maps, transmitted to it by the Board and include the classification maps in its general plan.

(2) Emphasize the conservation and development of identified significant mineral deposits.

(b) Every lead agency shall submit its proposed mineral resource management policies to the Board for review and comment prior to adoption.

(c) Any subsequent amendment of the mineral resource management policies previously reviewed by the Board shall also require review and comment by the Board.

(d) Prior to permitting a use which would threaten the potential to extract minerals classified by the State Geologist as MRZ-3, the lead agency may cause to be prepared an evaluation of the area in order to ascertain the statewide or regional significance of the mineral deposits known or inferred to be located therein. The results of such an evuation shall be transmitted to the State Geologist and to the Board for review and comment.

7. *Periodic Review of Classified Lands*

(a) After a period not to exceed 10 years following transmittal of mineral land classification information to lead agencies, the State Geologist shall review the information to determine whether:

(1) A reclassification of the area is necessary.

(2) The projected requirements for *Construction Materials* (Subsection 3c of Section I of these guidelines) for 50 years should be revised. The State Geologist shall report the results of such reviews to the Board together with his recommendations.

(b) The Board may direct the State Geologist to reexamine mineral lands already classified on the basis of his recommendation, or for other reasons. Any resulting reclassification shall be treated in the same manner as the original classification, and employ the same marketability and threshold criteria. The approximate span of time indicated above as being "the foreseeable future" for purposes of estimating marketability shall begin anew at time of reclassification.

SECTION II. PROCEDURES FOR DESIGNATION OF LANDS CONTAINING SIGNIFICANT MINERAL DEPOSITS

1. *Designation Criteria*

Areas to be considered for designation by the Board will contain one or more mineral deposits of statewide or regional significance. Ordinarily, classification of an area as MRZ-2 by the State Geologist will constitute adequate evidence that an area contains significant mineral deposits, but other data shall be considered by the Board in determining the significance of specific mineral deposits and the desirability of designation.

2. *Designation Procedures*

(a) Upon receipt from the State Geologist of a mineral lands classification map and report delineating one or more areas classified as MRZ-2 or SZ, the Board shall:

(1) Review the map and report to determine the sufficiency of the submitted data as a basis for designation, and request such additional information as may be required for the State Geologist or other sources.

(2) Determine the need for, and the priority of, designating the MRZ-2 and SZ areas, taking into consideration the importance of the mineral deposits to the State or region thereof and the imminency of any threatened land use changes that would be incompatible with mineral extraction.

(3) Notify the appropriate lead agencies of the decision to consider designation of one or more mineral resource areas within their jurisdiction.

(4) Set a date and place for a public hearing to consider the areas which the Board proposes to designate as containing mineral deposits of statewide or regional significance. If practicable, the public hearing shall be held in or near the county in which the area proposed for designation occurs.

(5) Notify all affected agencies and parties having an interest in the lands considered for designation.

(b) At the public hearing to consider proposed designations, the Board shall seek the recommendations of concerned federal, state and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals in the identification of mineral deposits of statewide or of regional significance. Such review and comment should address:

(1) The adequacy of the mineral land classification data transmitted by the State Geologist and of any additional data transmitted by the Board, which together will constitute the principal basis for designation.

(2) Additional data bearing on the presence and marketability of mineral deposits proposed to be of statewide or of regional significance in the area under consideration.

(3) The need, amount and location of mineral deposits of regional significance, namely *Construction Materials* as defined in Section 1, Subsection 1b of these guidelines, that should be designated to provide for the needs of the region for 50 years.

(4) The need for the proposed designation of each mineral deposit of statewide significance, namely, *Industrial and Chemical Mineral Materials, Metallic and Rare Minerals, Non-fluid Mineral Fuels, and Rocks, Minerals and Fossils of Outstanding Scientific Significance,* as defined in Section 1, Subsection 1b of these guidelines. Ordinarily, such deposits are uncommon or rare, and economically significant occurrences warrant designation. However, some types, such as low grade limestone, low grade clays and other rock varieties that may be processed into valuable mineral products are often present in such large quantities that designation would be warranted only where special circumstances exist. Such circumstances might include proximity of a mineral deposit to markets, transportation, energy sources, or to other raw materials with which they could be combined to produce more valuable products.

(5) The existing uses of the areas proposed for designation and the future uses of these areas adopted by local agencies.

(6) Values relating to recreation, watershed, wildlife, range and forage, and aesthetic enjoyment.

(c) Following the public hearing, the Board may designate to be of statewide or regional significance, and include in state policy, all or part of the areas classified as MRZ-2 or SZ. The designation shall specify the following:

(1) The boundaries of the designated area.

(2) The mineral deposits of statewide or of regional significance contained in each designated area and an estimate of the amount of each mineral commodity that is available for mining under present or foreseeable technologic, economic and land use conditions, for MRZ-2 areas, or a description of the materials of scientific value in the SZ area.

(3) The reason that each designated area is of significance to the State or region, the advantages to the State or region that might be achieved from the extraction of the minerals of the area, and the adverse effects that might result from premature development to land uses which would preclude mining.

(4) The time limit, if any, for the designation.

(5) The specific goals and policies to protect the areas containing mineral deposits designated to be of statewide or regional significance from premature development to uses which would preclude mining, or to uses with which mining would be incompatible.

(6) Lead agencies having jurisdiction over the area.

3. *Lead Agency Designation Responsibilities*

(a) Upon designating an area containing significant mineral deposits the Board will transmit a report of its action to the affected lead agencies. The report will include a map of the designated areas at a scale suitable for general plan purposes.

(b) Every lead agency within 12 months of the designation of an area of statewide or regional significance within its jurisdiction, shall:

(1) Recognize and include in its general plan the designated areas of statewide and regional significance transmitted to it by the Board.

(2) Develop and adopt policies for the management of land use of areas classified MRZ-2 or SZ and designated by the Board as areas of statewide and regional significance to protect those areas from premature development incompatible with mining.

(3) Emphasize the conservation and development of mineral deposits designated by the Board to be of statewide or regional significance.

(c) Prior to the adoption of mineral resource management policies, lead agencies shall submit them to the Board for review and comment. The Board shall make its comment within 60 days of receipt of the proposed policies. Any subsequent amendment to these resource management policies shall also require Board review and comment.

(d) The Board shall continuously monitor local government implementation of its mineral resource management policies for designated areas.

4. *Petitions for Designation*

(a) Prior to permitting a use which would threaten the potential to extract minerals classified by the State Geologist as MRZ-2 or SZ but not yet designated, the lead agency may petition the Board for a designation hearing.

(b) Petitions for a designation hearing may also be brought before the Board by any other party provided that the Board has received and approved land classification information that indicates that the area in question is classified MRZ-2 or SZ and that the Board has not yet considered designation. Petitions submitted to the Board shall include the following information.

(1) The petitioner's name, mailing address and interest (beneficial, jurisdictional, or other) in the area to be considered for designation.

(2) A map (USGS 7½′ quadrangle or other appropriate map) showing the boundaries of the MRZ-2 or SZ area the petitioner wishes to be designated.

(3) The reasons for requesting designation.

(4) The name and mailing address of each recorded land owner and each recorded lessee in and adjoining the area described. The Board shall then evaluate the data submitted in the petition as to its accuracy and sufficiency. If the Board finds that the petition contains sufficient information and arguments to require a public hearing, then the Board shall schedule such a hearing and proceed as outlined in this section.

5. *Termination of Designation Status*

(a) The status of mineral lands previously designated to be of statewide or regional significance may be terminated, either partially or wholly, by the Board on a finding that the protection afforded by designation is no longer necessary. In making this finding the Board shall consult with affected lead agencies as to the desirability of terminating designation. Such a finding may result from, but not be limited to, the following reasons:

(1) Depletion of the mineral deposit or deposits within the designated area.

(2) The mineral deposit or deposits within the designated area are shown to be in excess of quantities required for present or foreseeable future statewide or regional needs.

(3) Ending of the time limit, if any, for the designation to be in force.

(b) Prior to making such a finding, the Board shall hold a public hearing. If practicable it shall be held in or near the county in which the designated areas occur.

(c) Petitions may be brought before the Board to terminate the designated status of mineral lands. Petitions submitted to the Board shall include the following information:

(1) The petitioner's name, mailing address and interest (beneficial, jurisdictional or other) in the petitioned area.

(2) A map (USGS 7½′ quadrangle or other appropriate map) and legal description of the petitioned area.

(3) Reference shall be made to the specific Board action which designated the area.

(4) The reasons and supporting data as to why direct Board involvement is no longer necessary. The Board shall then evaluate the data submitted in the petition as to its

accuracy and sufficiency. If the Board finds that the petition contains sufficient information and arguments to require a public hearing on termination, then the Board shall schedule such a hearing and proceed as outlined in this section.

6. *CEQA Compliance*

The designation by the Mining and Geology Board of mineral bearing areas as being of regional or statewide significance is an activity which requires compliance with the California Environmental Quality Act (CEQA), and an environmental impact report will be required if the designation may have a significant effect on the enviroment. The Board will have the responsibility for preparing any environmental documents which may be required with the assistance of the State Geologist and the Division of Mines and Geology (Adopted 1/3/79).

SECTION III. GUIDELINES FOR CLASSIFICATION-DESIGNATION PETITIONS (Adopted 7/12/79)

1. *Introduction*

The State Mining and Geology Board recognizes the mineral potential of non-urban areas in California such as the California Desert Conservation Area and other federal lands in the state. However, the Board is constrained in pursuing a comprehensive classification-designation program in these areas because of the urban orientation of the Surface Mining and Reclamation Act and restrictions in the 1978 Budget Act.

The Surface Mining and Reclamation Act, Section 2761, provides that the State Geologist shall classify for mineral potential, areas identified by the Office of Planning and Research as urban and urbanizing, and such other areas as may be specified by the Board. The 1978 Budget Act requires that "positions engaged in the classification of mineral resource areas pursuant to Section 2761 of the Public Resources Code shall be used principally for the classification of such areas within urban and urbanizing portions of the State that are subject to urban expansion or other irreversible land uses".

A petition process is provided in the Board's "Guidelines for Classification and Designation of Mineral Lands" as a means of bringing to the Board's attention significant mineral deposits which have not yet been classified in both urban and non-urban areas that are subject to irreversible land uses incompatible with mining.

However, petitions for mineral deposits in non-urban areas submitted pursuant to the guidelines may not be acted upon in a timely fashion due to funding and staffing constraints. Rather than place a moratorium on petitions from these areas, the Board developed criteria to guide it in accepting petitions and establishing their priority for classification.

These criteria also serve as a guide to potential petitioners in assessing whether a petition for a particular deposit may be acceptable to the Board and also as a guide in preparing petitions. The State Mining and Geology Board urges petitioners to review the petition process closely in the context of the classification-designation process.

It should be recognized that petitioning does not create an instantaneous action, but rather starts in motion the classification-designation process which requires actions by the State Geologist, the Mining and Geology Board, and lead agencies prior to a final land-use decision.

The Board shall notify affected lead agencies upon formal acceptance of a petition for classification and provide them with a copy of the petition. The Board shall also notify lead agencies of each petition's assigned priority for classification.

2. *Criteria for Consideration of Petitions*

(a) The State Mining and Geology Board shall be guided in its consideration of petitions for classification-designation by the following criteria:

(1) The petitioned mineral deposit must meet the threshold value and other criteria for classification as MRZ-2 as specified in Section 1, paragraphs 1 (Classification Criteria) and 2 (Mineral Resource Zones and Scientific Zones) of the "Guidelines for Classification and Designation of Mineral Lands".

(2) The petitioned deposit must be threatened by a land use incompatible with mining which is of such imminency that Board action is required. The threat must be one that could be alleviated by a lead agency responsible for making land-use decisions pursuant to SMARA and Board guidelines.

(3) The petitioner must supply sufficient geologic and economic data with each petition to enable the State Geologist to classify the mineral deposit areas that are the subject of the petition. If the petitioner desires that deposits in areas classified as MRZ-2 by the State Geologist be designated by the Board as being of statewide or regional significance, then the petitioner must supply the environmental information required by the California Environmental Quality Act. Information submitted with the petitions will be of public record.

(4) Petitions will require a third party review of the submitted mineral resource data to determine:

(i) If the submitted data is adequate, and

(ii) If the deposit meets the threshold value and other criteria required to qualify for classification as MRZ-2.

Petitions will also require a third party analysis of the land-use threat, its incompatibility with mining, and its imminency. The reviewers, who shall be funded by the petitioner, shall be selected by and report to the Board and State Geologist.

(b) A petition form is provided in Appendix C.

3. *Priority Considerations*

(a) After acceptance of a petition by the Board, its priority for classification shall be established in consultation with the State Geologist. The Board shall be guided by the following considerations:

(1) Petitions for mineral deposits in urban and urbanizing areas that require market or area surveys (i.e. construction materials) shall be considered in the context of priorities established by the Board for the Division of Mines and Geology's five-year mineral lands classification program. See Appendices A and B for the priorities of this program.

(2) Petitions for specific mineral deposits in non-urban areas which do not require market or area surveys (i.e. industrial and chemical mineral materials, metallic and rare minerals, and non-fluid mineral fuels) shall be assigned a priority by the Board for consideration for spot classification and designation on the basis of their apparent economic significance to the state and urgency for classification.

APPENDIX A-4

State Mining And Geology Board Guidelines
For Mineral Resources Management

PART III

GUIDELINES FOR MINERAL RESOURCE MANAGEMENT

PREFACE

The Surface Mining and Reclamation Act of 1975, enacted as Chapter 9, Division 2 of the Public Resources Code, requires the State Mining and Geology Board to adopt State policies relative to mineral resource conservation and development.

Pursuant to this requirement, the Board adopted the Guidelines for Mineral Resource Management following a May 25, 1979, public hearing held in Sacramento, California.

STATE MINING AND GEOLOGY BOARD GUIDELINES FOR MINERAL RESOURCE MANAGEMENT

Introduction—In 1971, the State Legislature amended the Government Code to require that local government include a conservation element in its general plan. This element covers the conservation, development, and utilization of natural resources, including mineral resources.

The Surface Mining and Reclamation Act of 1975 contains specific provisions for the classification of mineral lands within the State by the State Geologist and the designation by the Mining and Geology Board of areas, classified by the State Geologist as MRZ-2, to be of regional or of statewide significance. These classified lands and designated areas ultimately will have to be recognized by local government in its general plan.

The mineral resource information developed under the classification-designation process gives local government an opportunity to update the conservation element of its general plan to determine policy and implement programs for the conservation and development of these resources.

The purpose of these guidelines is to suggest general goals and policies for use by local government to protect and assure the wise use of identified mineral resources. Specific policies and implementing programs will have to be developed by local government within the context of their general plan and mineral resource management situations within their jurisdiction.

Land uses which are compatible and incompatible with mining are defined.

MINERAL RESOURCE MANAGEMENT GOALS AND POLICIES

1. *Mineral Resource Management Goals*

Management of identified mineral resources by local government should be directed toward the following goals:

(a) Mineral lands classified MRZ-2 or designated as areas of statewide or of regional significance should be protected from preclusive and incompatible land uses so that the mineral resources with these lands and areas are available when needed.

(b) Surface mining within these classified lands and designated areas should be controlled to assure that:

(1) Adverse environmental effects are prevented or minimized and that mined lands are reclaimed to a usable condition which is readily adaptable for alternative land uses.
(2) The production and conservation of minerals are encouraged, while giving consideration to recreation, watershed, wildlife, range and forage, aesthetic enjoyment, and other environmental factors.
(3) Residual hazards to the public health and safety are eliminated.

2. *Mineral Resource Management Policies*

Mineral resource management policies developed by local government pursuant to the Surface Mining and Reclamation Act and Board guidelines should:

(a) Establish land-use categories which will allow for timely mineral extraction to meet projected demand in areas classified as MRZ-2 or designated to be of regional or statewide significance, and establish regulations for these land-use categories which will protect them from land uses which would preclude mineral extraction.

(b) Develop and implement regulations to insure that adequate supplies of mineral commodities are developed under a diversity of ownership to protect the consumer against the effects of restricted competition.

(c) Develop and implement regulations which will buffer land-use categories permitting mineral extraction from uses incompatible with mining.

(d) Develop and implement regulations to insure that after mitigative measures are taken, a proposed mining operation will not create any significant nuisances, hazards or adverse environmental impacts.

(e) Develop and implement regulations to insure that all mining operations provide for adequate reclamation of mined lands before issuing mining permits.

LAND USE COMPATIBILITY CATEGORIES

The following land-use categories are provided as a guide to local government in establishing compatible land uses on or adjacent to mineral lands classified as MRZ-2 or designated as areas of regional or statewide significance:

1. *Incompatible*—Land uses inherently incompatible with mining and/or which require a high public or private investment in structures, land improvements and landscaping and which would prevent mining because of the higher economic value of the land and its improvements.

Examples of such uses include:

High density residential
Low density residential with high unit value
Public facilities
Intensive industrial
Commercial

2. *Compatible*—Land uses inherently compatible with mining and/or which require a low public or private investment in structures, land improvements and landscaping and which would allow mining because of the low economic value of the land and its improvements.

Examples of such uses include:

Very low density residential
(For example: 1 unit per 10 acres)
Extensive industrial
Recreation (public/commercial)
Agricultural
Silvicultural
Grazing
Open space

(a) *Interim*—Land uses which require structures, land improvements and landscaping of a limited useful life and from an economic and political standpoint can be converted to mining at the end of that limited life. The period of interim use should be compatible with the orderly and timely production of mineral resources and the useful life of the improvements.

(b) *Buffer*—Land uses which provide sufficient distance and/or barriers between mining and incompatible land uses, to mitigate noise, dust vibration and visual impacts of mining, and to protect public safety.

APPENDIX A-5

Interim Criteria for Sectorization of MRZ-2 Areas

STATE OF CALIFORNIA—THE RESOURCES AGENCY EDMUND G. BROWN JR., Governor

DEPARTMENT OF CONSERVATION
DIVISION OF MINES AND GEOLOGY
DIVISION HEADQUARTERS
1416 NINTH STREET, ROOM 1341
SACRAMENTO, CA 95814
(Phone 916—445-1825)

October 27, 1982

Mr. Tito Patri, President
The Planning Collaborative, Inc.
Pier 33
North Embarcadero
San Francisco, CA 94111

Dear Tito:

Enclosed is our revised "Interim Criteria for the Sectorization of MRZ-2 Areas for Aggregate". This reflects input received from the SMGB and staff during our meeting on September 27 and will form the basis for sectorization by CDMG staff.

Sincerely,

James F. Davis
State Geologist

Enclosure

cc: Rudy Strand
Dave Beeby
Doug Sprague

Interim Criteria for Sectorization of MRZ-2 Areas for Aggregate

The purpose of sectorizing MRZ-2 areas is to provide a semi-quantified estimate of construction aggregate resources which are likely to be available to satisfy society's needs during the next 50 years. This estimate, when compared to CDMG projected needs for the next half century, provides the context for communities to plan for future resource availability in their land-use policies. The determination of sectors is intended for the use of the State Mining and Geology Board in identifying areas which are candidates for designation under SMARA. The development of sectors provides a perception of future mineral resource availability in the face of future needs and also portrays where these available minerals are generally located. This information is distributed by the Board to all affected lead agencies to provide them with the data necessary to plan for future resource availability in their land-use policies.

Areas within MRZ-2 classifications are sectorized if they have current land uses which are similar to those in areas which have been feasible mineral extraction in the past. Areas within MRZ-2 classifications which have generally not been available for surface mining in the past for specified social or economic reasons are not sectorized. Since such areas are unlikely to be used for surface mining during the foreseeable future, their inclusion in estimates of future resource availability would be misleading.

The estimation of future mineral resource availability in sectors is not a precise analysis, but rather is the best general estimate which can be made with the data presently available. Areas within and without sectors, can be used for mining or other land uses at the discretion of the local governments which are charged with responsibility for making land-use decisions. Establishment of sectors in no way infringes on this authority. Rather, it provides a perception of future mineral resource availabilities in the face of future needs and also portrays where these available minerals are generally located.

The following criteria will be used by CDMG in identifying mineral resource areas which are available for future use. These criteria, in conjunction with the geologic and geometric characteristics of specific mineral deposits will be used in sectorizing MRZ-2 areas. Use of these criteria will assure that sectors contain geologically homogeneous mineral deposits which, based upon current land use, will be available for future use.

These land-use criteria are interim and will be used on a trial basis by CDMG to evaluate their usefulness. CDMG will provide the SMGB with formal recommendations concerning these criteria early in fiscal year 1983-84.

The following specific land uses are considered to be generally incompatible with mining and will thus be excluded from sectors. Mineral resource areas containing land uses not specifically listed will be considered for sectorization. The criteria are to be applied only to lands classified as MRZ-2.

Interim Criteria for Sectorization of MRZ-2 Areas for Aggregate - Page Two

There are two general categories of exclusion: I) Economic Exclusion, and II) Social Exclusion.

I) Economic Exclusion

Specific excluded land uses are:

1) Residential areas
2) Commercial areas with land improvements (buildings)
3) Industrial areas (buildings and adjacent needed storage and parking facilities)
4) Major public or private engineering projects, including:

    a) canals
    b) freeways
    c) bridges
    d) airports and associated developments such as parking lots
    e) dams
    f) railroads
    g) major pipelines
    h) major power transmission lines

II) Social Exclusion

Specific excluded land uses are:

1) Cemeteries
2) Geologic Scientific Zones
3) Public parks, developed historical sites and structures, and public recreation areas of all types *
4) Public or private schools, institutions, hospitals, and prisons, including adjacent grounds and related structures
5) Military bases and reservations

October 27, 1982

*NOTE: Since the development of these interim criteria, a policy change regarding parklands has occurred. Parklands are now sectorized if they are not excluded on the basis of economic criteria. Sectorized parklands are, however, treated separately in the classification reports, and their mineral resources are not mixed with those occurring on other types of land.

MINERAL LAND CLASSIFICATION: AGGREGATE MATERIALS
IN THE SAN FRANCISCO – MONTEREY BAY AREA

SPECIAL REPORT 146 – Part I
1986

SPECIAL REPORT 146
PLATE 1.1

STATE OF CALIFORNIA - GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY - GORDON K. VAN VLECK, SECRETARY FOR RESOURCES
DEPARTMENT OF CONSERVATION - RANDALL M. WARD, DIRECTOR

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

CLASSIFIED AREAS IN THE SAN FRANCISCO – MONTEREY BAY AREA

NORTH SAN FRANCISCO BAY P-C REGION

SOUTH SAN FRANCISCO BAY P-C REGION

EXPLANATION

P-C REGION BOUNDARY

CLASSIFICATION BOUNDARY

URBANIZED

URBANIZING

As indentified by the Office of Planning and Research, July 1975.

NONURBAN

Authorized for Classification by State Mining and Geology Board.

UNCLASSIFIED

BY M.C. STINSON, M.W. MANSON AND J.J. PLAPPERT
1983

SCALE 1:500,000

10 0 10 20 30 40 MILES

10 0 10 20 30 40 50 KILOMETERS

UNCLASSIFIED

BY M.C.STINSON, M.W.MANSON AND J.J.PLAPPERT

1983

SCALE 1:500,000

10 0 10 20 30 40 MILES

10 0 10 20 30 40 50 KILOMETERS

SOUTH SAN FRANCISCO BAY P-C REGION

MONTEREY BAY P-C REGION

123°

121°

37°

36°

122°

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA – GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY – GORDON K. VAN VLECK, SECRETARY FOR RESOURCES
DEPARTMENT OF CONSERVATION – RANDALL M. WARD, DIRECTOR

SPECIAL REPORT 146
PLATE 1.2

SIGNIFICANT* AGGREGATE PRODUCTION OPERATIONS IN THE SAN FRANCISCO – MONTEREY BAY AREA, CALIFORNIA

*AS DEFINED IN *CALIFORNIA SURFACE MINING AND RECLAMATION POLICIES AND PROCEDURES*, CDMG SPECIAL PUBLICATION 51, FIRST REVISION, pp. 23-24.

EXPLANATION

● – Sand or sand & gravel

○ – Crushed stone

⊙ Sand & gravel and crushed stone

BY M.C. STINSON, M.W. MANSON AND J.J. PLAPPERT
1983

SCALE 1: 500,000
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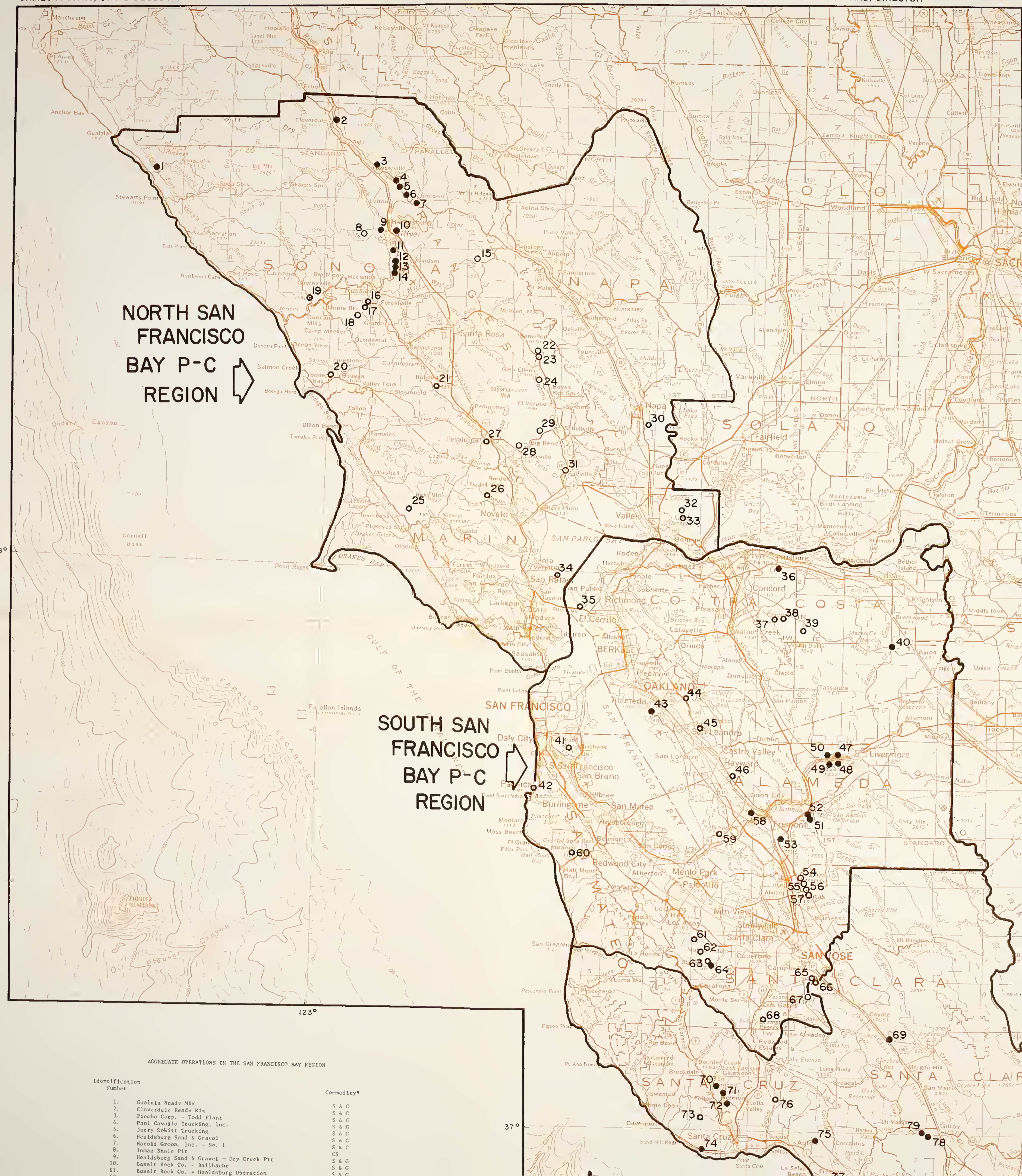

AGGREGATE OPERATIONS IN THE SAN FRANCISCO BAY REGION

Identification Number		Commodity*
1.	Gualala Ready Mix	S & G
2.	Cloverdale Ready Mix	S & G
3.	Piembo Corp. – Todd Plant	S & G
4.	Paul Cavallo Trucking, Inc.	S & G
5.	Jerry DeWitt Trucking	S & G
6.	Healdsburg Sand & Gravel	S & G
7.	Harold Groom, Inc. – No. 1	S & G
8.	Inman Shale Pit	CS
9.	Healdsburg Sand & Gravel – Dry Creek Pit	S & G
10.	Basalt Rock Co. – Bailhache	S & G
11.	Basalt Rock Co. – Healdsburg Operation	S & C

AGGREGATE OPERATIONS IN THE SAN FRANCISCO BAY REGION

BY M.C. STINSON, M.W. MANSON AND J.J. PLAPPERT

1983

SCALE 1:500,000

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10 0 10 20 30 40 50 KILOMETERS

SOUTH SAN FRANCISCO BAY P-C REGION

MONTEREY BAY P-C REGION

Identification Number		Commodity*
1.	Gualala Ready Mix	S & G
2.	Cloverdale Ready Mix	S & G
3.	Plumbo Corp. - Todd Plant	S & G
4.	Paul Covallo Trucking, Inc.	S & G
5.	Jerry DeWitt Trucking	S & G
6.	Healdsburg Sand & Gravel	S & G
7.	Harold Groom, Inc. - No. 1	S & G
8.	Inman Shale Pit	CS
9.	Healdsburg Sand & Gravel - Dry Creek Pit	S & G
10.	Basalt Rock Co. - Ballhache	S & G
11.	Basalt Rock Co. - Healdsburg Operation	S & G
12.	Quarry Products, Inc. - Windsor	S & G
13.	Basalt Rock Co. - Doyle Operation	S & G
14.	Kaiser Sand & Gravel - Windsor	S & G
15.	Mark West Shale Pit	CS
16.	Canyon Rock Company, Inc.	CS
17.	Blue Rock Co.	CS
18.	Green Valley Quarry	CS
19.	Bahan & Canelis Quarry	CS, S & G
20.	Hagemann Quarry	CS
21.	Stony Point Quarry	CS
22.	Nun's Canyon Quarry	CS
23.	Trinity Rock Co.	CS
24.	Serres Sand & Gravel	CS
25.	Borello Quarry	CS
26.	Ghilotti Brothers	CS
27.	Quarry Products, Inc. - Petaluma Quarry	CS
28.	Hartman Quarry	CS
29.	Stage Gulch Quarry	CS
30.	Basalt Rock Company - Napa Quarry	CS
31.	Sonoma Rock Quarry	CS
32.	Syar Industries, Inc. - Lake Herman Quarry	CS
33.	W.E. Martin - Lake Herman Quarry	CS
34.	Basalt Rock Company, Inc. - McNears Quarry	CS
35.	Quarry Products, Inc. - Point Molate Quarry	CS
36.	Eugene Alves Construction Co.	S & G
37.	Kaiser Sand & Gravel - Clayton Operation	CS
38.	Lone Star Industries, Inc. - Clayton Plant No. 135	CS
39.	Mt. Diablo Rock & Aggregates Co.	CS
40.	Ridgemoor Development Co. - Sand Hill Quarry	S
41.	Quarry Products, Inc. - Brisbane Quarry	CS
42.	Quarry Products, Inc. - Pacifica Quarry	CS
43.	Tidewater Sand & Gravel	S
44.	Callagher & Burke, Inc. - Leona Quarry	CS
45.	San Leandro Rock Company	CS
46.	East Bay Excavating Co., Inc. - La Vista Quarry	CS
47.	Rhodes & Jamieson, Ltd. - Pleasanton Operation	S & G
48.	Rhodes & Jamieson, Ltd. - California Rock Plt	S & G
49.	Lone Star Industries, Inc. - Eliot Plant No. 104	S & G
50.	Kaiser Sand & Gravel - Radum	S & G
51.	Santa Clara Sand & Gravel	S & G
52.	Mission Valley Rock Co., Inc. - Sunol Plant	S & G
53.	H. Sand's Quarry	S & G
54.	Curtner Quarry	CS
55.	Raisch Quarry	CS
56.	Swensen Quarry	CS
57.	Winterbaur Quarry	CS
58.	Quarry Products, Inc. - Niles	S & G
59.	Dumbarton Quarry Associates	CS
60.	Lone Star Industries, Inc. - Pillarcitos Site #138	CS
61.	Patton Brothers - Neary Quarry	CS
62.	Kaiser Cement, Inc. - Permanente Quarry	CS
63.	Stevens Creek Quarry, Inc.	CS
64.	Stevens Creek Quarry, Inc.	S & G
65.	Raisch Products - Acevedo Quarry	CS
66.	Hillsdale Rock Company - Hillsdale Quarry	CS
67.	Plazza Paving Co. - Hubble Quarry	CS
68.	Hillsdale Rock Company - Lexington Quarry	CS
69.	Granite Rock Company - Polak Plt	S & G
70.	Santa Cruz Aggregates Co. - Quail Hollow Quarry	S
71.	Lone Star Industries, Inc. - Olympia Quarry	S
72.	Kaiser Sand & Gravel - Olympia Quarry	S
73.	Felton Quarry	CS
74.	Granite Rock Company - Wilder Ranch	S & G
75.	Cabrillo Sand and Gravel	S & G
76.	Olive Springs Quarry, Inc.	CS
77.	Granite Construction Company - O'Connell Quarry	S & G
78.	Brem's Sand & Gravel - Miller Avenue Plant	S & G
79.	Western Tile and Supply Co.	S & G
80.	Granite Construction - Pacheco Creek	S & G
81.	Granite Rock Company - Logan Quarry	CS
82.	Mel Williams Sand & Gravel Co.	S & G
83.	Hillsdale Rock Company - San Juan Plant #6	S & G
84.	Evergreen Concrete, Inc. - San Juan Diaz Plt	S & G
85.	Hillsdale Rock Company - Plant #5 Hollister	S & G
86.	Granite Rock Company - Hollister Plant	S & G
87.	Rider and Son Quarry	S & G
88.	Kaiser Refractories - Natividad Plant	CS
89.	Lone Star Industries, Inc. - Lapis #110	S
90.	Lone Star Industries, Inc. - Prattco #109	S
91.	Granite Construction Co. - Pebble Beach Operation	CS
92.	King City Transit Mix, Inc.	S & G
93.	South County Sand & Gravel Co.	S & G
94.	Clark Trucking Services, Inc. - Topo Aggregates	S & G

*CS - Crushed stone, S - Sand, S & G - Sand and Gravel

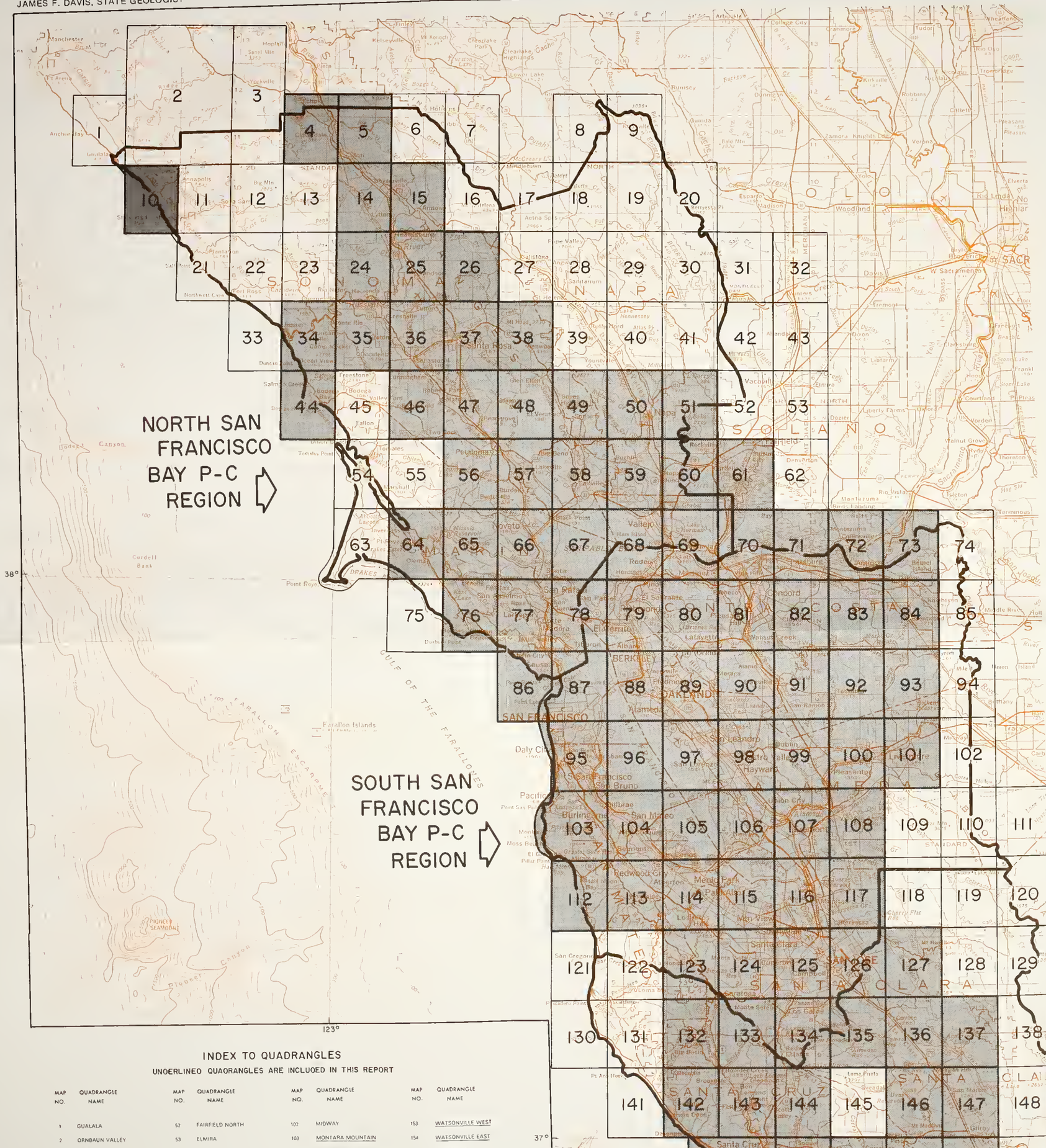
TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY

DIVISION OF MINES AND GEOLOGY
JAMES F. DAVIS, STATE GEOLOGIST

STATE OF CALIFORNIA – GEORGE DEUKMEJIAN, GOVERNOR
THE RESOURCES AGENCY – GORDON K. VAN VLECK, SECRETARY FOR RESOURCES
DEPARTMENT OF CONSERVATION – RANDALL M. WARD, DIRECTOR

SPECIAL REPORT 146
PLATE 1.3

SAN FRANCISCO—MONTEREY BAY AGGREGATE PRODUCTION-CONSUMPTION REGIONS SHOWING U.S. GEOLOGICAL SURVEY QUADRANGLE BOUNDARIES



INDEX TO QUADRANGLES

UNDERLINED QUADRANGLES ARE INCLUDED IN THIS REPORT

MAP NO.	QUADRANGLE NAME	MAP NO.	QUADRANGLE NAME	MAP NO.	QUADRANGLE NAME	MAP NO.	QUADRANGLE NAME
1	GUALALA	52	FAIRFIELD NORTH	102	MIDWAY	153	WATSONVILLE WEST
2	ORNBAUN VALLEY	53	ELMIRA	103	MONTARA MOUNTAIN	154	WATSONVILLE EAST
3	HOPLAND	54	TOMALES	104	SAN MATEO	155	CHITTENDEN

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SOUTH SAN FRANCISCO BAY P-C REGION

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2	ORNBAUN VALLEY	53	ELMIRA	103	MONTARA MOUNTAIN	154	WATSONVILLE EAST
3	HOPLAND	54	TOMALES	104	SAN MATEO	155	CHITTENDEN
4	CLOVERDALE	55	POINT REYES NE	105	REDWOOD POINT	156	SAN FELIPE
5	ASTI	56	PETALUMA	106	NEWARK	157	THREE SISTERS
6	THE GEYSERS	57	PETALUMA RIVER	107	NILES	158	MARIPOSA PEAK
7	WHISPERING PINES	58	SEARS POINT	108	LA COSTA VALLEY	159	MOSS LANDING
8	JERICHO VALLEY	59	CUTTINGS WHARF	109	MENDENHALL SPRINGS	160	PRUNEDALE
9	KNOXVILLE	60	CORDELIA	110	CEDAR MOUNTAIN	161	SAN JUAN BAUTISTA
10	STEWARTS POINT	61	FAIRFIELD SOUTH	111	LONE TREE CREEK	162	HOLLISTER
11	ANNAPOLIS	62	DENVERTON	112	HALF MOON BAY	163	TRES PINOS
12	TOMBS CREEK	63	DRAKES BAY	113	WOODSIDE	164	QUIEN SABE VALLEY
13	SKAGGS SPRINGS	64	INVERNESS	114	PALO ALTO	165	RUBY CANYON
14	GEYSERVILLE	65	SAN GERONIMO	115	MOUNTAIN VIEW	166	MARINA
15	JIMTOWN	66	NOVATO	116	MILPITAS	167	SALINAS
16	MOUNT SAINT HELENA	67	PETALUMA POINT	117	CALAVERAS RESERVOIR	168	NATIVIDAD
17.	OETERT RESERVOIR	68	MARE ISLAND	118	MOUNT DAY	169	MOUNT HARLAN
18	AETNA SPRINGS	69	BENICIA	119	EYLAR MOUNTAIN	170	PAICINES
19	WALTER SPRINGS	70	PORT CHICAGO	120	MOUNT BOARDMAN	171	CHERRY PEAK
20	BROOKS	71	HONKER BAY	121	SAN GREGORIO	172	PANOCHE PASS
21.	PLANTATION	72	ANTIOCH NORTH	122	LA HONDA	173	MONTEREY
22	FORT ROSS	73	JERSEY ISLAND	123	MINDEGO HILL	174	SEASIDE
23	CAZADERO	74	BOULOIN ISLAND	124	CUPERTINO	175	SPRECKLES
24	GUERNEVILLE	75.	DOUBLE POINT	125	SAN JOSE WEST	176	CHUALAR
25.	HEALDSBURG	76	BOLINAS	126	SAN JOSE EAST	177	GONZALES
26	MARK WEST SPRINGS	77	SAN RAFAEL	127	LICK OBSERVATORY	178	MOUNT JOHNSON
27	CALISTOGA	78	SAN QUENTIN	128	ISABEL VALLEY	179	BICKMORE CANYON
28	SAINT HELENA	79	RICHMOND	129	MOUNT STAKES	180	SAN BENITO
29	CHILES VALLEY	80	BRIONES VALLEY	130	PIGEON POINT	181	SOBERANES POINT
30	LAKE BERRYESSA	81.	WALNUT CREEK	131	FRANKLIN POINT	182	MOUNT CARMEL
31	MONTICELLO DAM	82	CLAYTON	132	BIG BASIN	183	CARMEL VALLEY
32	WINTERS	83	ANTIOCH SOUTH	133	CASTLE ROCK RIDGE	184	RANA CREEK
33	ARCHED ROCK	84	BRENTWOOD	134	LOS GATOS	185	PALO ESCRITO PEAK
34	DUNCANS MILLS	85	WOODWARD ISLAND	135	SANTA TERESA HILLS	186	SOLEDAD
35	CAMP MEEKER	86	POINT BONITA	136	MORGAN HILL	187	NORTH CHALONE PEAK
36	SEBASTOPOL	87.	SAN FRANCISCO NORTH	137	MOUNT SIZER	188.	TOPO VALLEY
37	SANTA ROSA	88	OAKLAND WEST	138	MISSISSIPPI CREEK	189	POINT SUR
38	KENWOOD	89	OAKLAND EAST	139	MUSTANG PEAK	190.	BIG SUR
39	RUTHERFORD	90	LAS TRAMPAS RIDGE	140	CREVISON PEAK	191	VENTANA CONES
40.	YOUNTVILLE	91	DIABLO	141.	ANO NUEVO	192	CHEWS RIDGE
41	CAPELL VALLEY	92	TASSAJARA	142	DAVENPORT	193	SYCAMORE FLAT
42	MOUNT VACA	93	BYRON HOT SPRINGS	143	FELTON	194	PARAISO SPRINGS
43	ALLENDALE	94	BETHANY	144	LAUREL	195	GREENFIELD
44	BODEGA HEAD	95	SAN FRANCISCO SOUTH	145	LOMA PRIETA	196	PINALITO CANYON
45	VALLEY FORD	96	HUNTERS POINT	146	MOUNT MADONNA	197	PFEIFFER POINT
46	TWO ROCK	97	SAN LEANDRO	147	GILROY	198	PARTINGTON RIDGE
47.	COTATI	98	HAYWARD	148.	GILROY HOT SPRINGS	199	TASSAJARA HOT SPRINGS
48	GLEN ELLEN	99	DUBLIN	149	PACHECO PEAK	200.	JUNIPERO SERRA PEAK
49	SONOMA	100	LIVERMORE	150.	PACHECO PASS	201	RELIZ CANYON
50	NAPA	101	ALTAMONT	151	SANTA CRUZ	202	THOMPSON CANYON
51	MOUNT GEORGE			152	SOQUEL	203	SAN LUCAS

TOPOGRAPHIC BASE MAP BY U.S. GEOLOGICAL SURVEY